Total No. of Questions—12]

Seat	
No.	

### [5252]-1

### S.E. (Mechanical/Auto) (Second Semester) EXAMINATION, 2017 PRODUCTION TECHNOLOGY

#### (2008 PATTERN)

#### **Time : Three Hours**

Maximum Marks : 100

- **N.B.** :- (i) Answers to the two sections should be written in separate answer-books.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (iv) Assume suitable data, if necessary.

#### SECTION I

- 1. (a) In an orthogonal cutting operation the following are the observations : [10]
  - (i) Cutting speed = 120 m/min
  - (*ii*) Rake angle =  $10^{\circ}$
  - (*iii*) Width of cut = 6.35 mm
  - (iv) Uncut chip thickness = 0.127 mm
  - (v) Cutting force = 567 N
  - (vi) Thrust Force = 227 N
  - (vii) Chip Thickness = 0.228 mm.

Calculate :

Shear angle, friction angle, shear stress along the shear plane, chip velocity, shear strain, cutting power.

(b) What is Machinability ? What are the parameters affecting machinability ?[8]

Or

- 2. (a) The following data was collected from an orthogonal Machine Test on Steel [10] Cutting speed = 18 m/min. Rake angle = 20° Undeformed chip thickness = 0.10 mm. Deformed chip thickness = 0.25 mm. Width of cut = 3.2 mm. Cutting force = 800 N. Normal force = 500 N. Clearance angle = 10° Calculate : Shear angle, Friction coefficient against chip flow, friction force on rake face.
  - (b) Explain various factors affecting tool life. [8]
- 3. (a) Explain the process of gear hobbing with neat sketch. [6]
  (b) Explain types of Broaching Machines. [5]
  - (c) Explain the process of thread milling with neat sketch. [5]

Or

4. (a) Explain gear finishing method. [8]

[5252]-1

- (b) Explain process of thread rolling and advantages of thread rolling.[8]
- 5. (a) Explain the parts and working of CNC system with neat figures.
  - (b) Differentiate between : [4×2=8]
    - (i) Machine centre and conventional machines
    - (*ii*) DNC and FMS.

6. (a) Explain automatic tool changing and components of the system.

[8]

- (b) Write short notes on (any two) : [8]
  - (i) G codes
  - (ii) Automatic pallet changer
  - (*iii*) Canned cycles.

#### SECTION II

- 7. (a) Explain various types of dies used in press work and with neat sketch. [10]
  - (b) Describe the following terms : [8]
    - (i) Centre of Pressure
    - (ii) Strip Layout.

#### Or

8. (a) Explain methods of reducing cutting forces in sheet metal working. [8]

3

$$[5252]-1$$

 (b) Design and draw a progressive die for manufacturing mild steel part of 1 mm thickness as shown in fig. and ultimate shear strength is 540 N/mm<sup>2</sup>. [10]



- 9. (a) Explain EDM in detail with neat sketch and state advantages, disadvantages and application. [8]
  - (b) Explain abrasive jet machining and state its parameters, advantages and limitations. [8]

#### Or

- 10. (a) Explain electro-chemical process in detail with neat sketch and state its advantages and disadvantages. [8]
  - (b) Compare EBM and LBM Processes. [8]

11. (a) Describe the design principles common to jig and fixtures.

[8]

- (b) Write short notes on (any two) : [8]
  - (*i*) Turning Fixture
  - (ii) 3-2-1 Principle of Location
  - (iii) Quick acting clamping device

#### [5252]-1

4

- 12. (a) Explain with neat sketch of various clamping devices. [8]
  (b) Write short notes on (any two) [8]
  - (*i*) Drill Bushes
  - (ii) Locating devices
  - (*iii*) Broaching Fixture.

Total No. of Questions—12]

[Total No. of Printed Pages-4

Seat No.

### [5252]-4

### S.E. (E.&Tc/ETx) (First Semester) EXAMINATION, 2017 POWER DEVICES & MACHINES (2008 PATTERN)

#### **Time : Three Hours**

#### Maximum Marks : 100

**N.B.** :— (i) Answer any three questions from each section.

- (*ii*) Answers to the two sections should be written in separate answer books.
- (iii) Neat diagrams must be drawn wherever necessary.
- (iv) Figures to the right indicate full marks.
  - (v) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- (vi) Assume suitable data if necessary.

#### SECTION-I

- (a) Draw and explain basic structure and steady state characteristics of power diode. [6]
  - (b) What are the advantages of IGBT over power MOSFET and Power BJT. [6]
  - (c) The reverse recovery time of a diode is 3  $\mu$ s. and the rate of fall of diode current is di/dt = 30A/ $\mu$ s. Determine :
    - (1) Storage charge,
    - (2) Peak reverse current. [4]

2.	<i>(a)</i>	Draw and explain static characteristics of Power MOSFE	ET.
			[6]
	( <i>b</i> )	Draw and explain basic structure of IGBT.	[6]
	( <i>c</i> )	Compare MOSFET with Power BJT.	[4]
3.	( <i>a</i> )	With the help of four layer structure and two transistor analysis and the second structure and structur	ogy
		explain V—I characteristics of SCR.	[8]
	( <i>b</i> )	Sketch and explain circuit diagram and waveforms	of
		line synchronised UJT oscillator for triggering of SCR.	[8]
		Or	
4.	<i>(a)</i>	Sketch cross-sectional view of TRIAC and explain its four mo	des
		of operation.	[8]
	( <i>b</i> )	Define holding and latching currents for SCR.	[4]
	( <i>c</i> )	Justify high frequency pulse triggering is preferred to trig	ger
		the SCR.	[4]
5.	( <i>a</i> )	Draw the circuit diagram of single phase semiconverter	for
		R-load. Explain the operation with the help of voltage a	and
		current waveforms for $\alpha = 45^{\circ}$	[8]
	( <i>b</i> )	A single phase semiconductor is operated from 120 V, 50	Hz
		AC supply. The load resistance is 10 $\Omega$ . If the average out	put
		voltage is 30% of the maximum possible average output volta	age,
		determine	
		( <i>i</i> ) Firing angle	

- RMS and Average output current (ii)
- RMS and Average thyristor current (iii) [6]
- Shortly explain commutation circuits used for SCR. [4] (*c*)  $\mathbf{2}$ [5252]-4

- 6. (a) With neat circuit diagram and necessary waveforms, explain working of 3-phase full converter with R-load. [10]
  - (b) With neat circuit diagram and necessary waveforms, explain the operation of single phase AC voltage full controller for R load.

#### **SECTION-II**

- 7. (a) With neat circuit diagram and necessary waveforms explain the operation of stepdown chopper for R-load and hence derive expressions for  $V_{avg}$ . and  $V_{rms}$ . [8]
  - (b) A step-down dc chopper has a resistive load of  $R = 15\Omega$ and input voltage  $E_{dc} = 200$  V. When chopper remains on its voltage drop is 2.5V. The chopper frequency is 1 kHz. If duty cycle is 50%. Find : [9]
    - (1) Average output voltage
    - (2) RMS output voltage
    - (3) Effective input resistance of chopper

#### Or

- 8. (a) With neat circuit diagram and necessary waveforms explain the operation of single phase full bridge inverter with R-load.
  - (b) Derive the output voltage equation in terms of duty cycle for step up chopper and hence explain its behaviour for duty cycle below 0.5 and above 0.5. [5]
  - (c) With the help of block diagram explain working of SMPS. [4]

3

- **9.** (a) Derive back *emf* equation for DC motor. [4]
  - (b) Derive torque equation for DC motor. [5]
  - (c) A 250 V DC shunt motor on no load runs at 1000 rpm and takes current 5A from supply. The armature and shunt field resistances are  $0.2\Omega$  and  $250\Omega$  respectively. Calculate the speed of the motor when loaded and taking current of 50A from supply. [8]

- 10. (a) Differentiate squirrel cage induction motor with slip-ring induction motor. [4]
  - (b) Draw and explain Torque–Slip characteristics of 3–ph induction motor.
  - (c) With neat circuit diagram explain v/f control method for 3-phase induction motor. [7]
- 11. (a) Explain with neat sketches different connections used for 3-ph transformer. State applications of each connection. [8]
  - (b) Explain construction, working & applications of variable reluctance stepper motor. [8]

#### Or

- 12. (a) Explain construction, working, characteristics and applications of AC servo motor. [8]
  - (b) Write short notes on :
    - (1) Current transformer. [4]
    - (2) Constant current transformer. [4]

Total No. of Questions—6]

Maximum Marks : 50

Seat	
No.	

### [5252]-5

### S.E. (Elect./E&TC) (Second Semester) EXAMINATION, 2017 ELECTROMAGNETICS

#### (2008 PATTERN)

Time : Two Hours

- **N.B.** :- (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6.
  - (*ii*) Answer all questions in same answer-book.
  - (iii) Figures to the right side indicate full marks.
  - (*iv*) Use of calculator is allowed.
  - (v) Neat diagrams must be drawn whenever necessary.
  - (vi) Assume suitable data, if necessary.
- (a) Derive the expression for Electric Field Intensity for a surface charge, uniformly distributed over an Infinite Sheet (ρs C/m<sup>2</sup>) placed in X-Y plane at, a point P, placed on Z-axis.
  - (b) A total charge of (40/3) nC is uniformly distributed around a circular ring of radius 2 m. Find the potential at a point on Z-axis, 5 m from the plane of the ring. Also find the potential if the charge is concentrated at origin. [8]

Or

(a) Derive the expression for the Flux Density (D) in all the regions of a uniformly charged sphere of radius 'a' with a uniform charge ρv C/m<sup>3</sup>.

- (b) For two-concentric spherical shells V = 0 for r = 0.10 m and V = 100V for r = 2.0 m. Assuming free space in between these shells, find  $\overline{E}$  &  $\overline{D}$  using Laplace's equation. [8]
- 3. (a) For an infinite length current element, current is flowing along Z-direction. Find the Magnetic field Intensity at a point P  $(\rho, \Phi, z)$ . [8]
  - (b) The region z < 0 contains a perfect Dielectric for which  $\varepsilon_{r_1} = 2.5$  while the region z > 0 is characterized by  $\varepsilon_{r_2} = 4$ . Let  $\overline{E}_1 = -30\hat{a}_x + 50\hat{a}_y + 70\hat{a}_z$  V/m. Find :
    - (*i*)  $\overline{E}_{n1}$
    - $(ii) \quad \overline{E}_{t1}$
    - $(iii) \quad \overline{E}_{t2}$
    - $(iv) \quad \overline{E}_2$
    - (v) The angle  $\theta_1 \leq 90^\circ$  between  $\overline{E}_1$ , and a normal to the surface  $\overline{E}_{n1}$ ,
    - (vi)  $\overline{D}_{n2}$
    - $(vii) \overline{D}_{t2}$
    - $(viii) \ \overline{D}_2$ [8]

4. (a) A circular loop of wire of radius 'a', lying in xy plane with its centre at the origin carries a current I in the + direction. Using Biot-Savart law find H (0, 0, z) and  $\overline{H}$  (0,0,0).

[8]

(b) Derive the Boundary Conditions for an interface in between a Conductor and Dielectric. [8]

[5252]-5

5.	(a)	Derive the expression for Poynting's vector. Explain t	the
		significance of each term. [	[10]
	( <i>b</i> )	Write a short note on Finite Element Method.	[8]

- 6. (a) State Maxwell's equations for Static Fields, in differential and Integral form along with the significance. [10]
  - (b) Explain finite difference method in detail. [8]

Total No. of Questions-12]

Maximum Marks : 100

Seat	
No.	

**Time : Three Hours** 

### [5252]-6

### S.E. (E&TC./Ex.) (II Semester) EXAMINATION, 2017 ELECTROMAGNETIC

#### (2008 PATTERN)

**N.B.** :- (i) Answer to the two sections should be written in separate anwer-book.

- (ii) Answer three questions from each section.
- (iii) Neat diagrams must be drawn wherever necessary.
- (iv) Figures to the right indicate full marks.
- (v) Use of calculator is allowed.
- (vi) Assume suitable data, if necessary.

#### SECTION I

- 1. (a) Derive the expression for electric field intensity  $\overline{E}$  at point  $\overline{P}$  due to infinite line charge with uniform line charge density  $\rho_{L}$ . [9]
  - (b) State and explain Coulomb's law. A point charge of 20nC is located at origin. Determine  $\overline{E}$  at point P(1, 3 -4). [9]

#### Or

- (a) State and prove Gauss's Law. Explain any one application of Gauss' law.
   [9]
  - (b) Three infinite uniform sheets of charge are located in free space as follows : [9]  $3 \text{ nC/m}^2$  at z = -4,  $6 \text{ nC/m}^2$  at z = 1,  $-8 \text{ nC/m}^2$  at z = 4. Find  $\overline{E}$  at the point :

(*i*) 
$$P_A = (2, 5, -5)$$

$$(ii)$$
 P<sub>B</sub> =  $(4, 2, -3)$ 

(iii)  $P_{c} = (-1, -5, 2).$ 

- **3.** (a) Define work done and potential difference. Drive expression between  $\overline{E}$  and V. [8]
  - (b) Using Laplace's equation derive the expression for capacitance of parallel plate capacitor. [8]

- 4. (a) Derive the expression for capacitance of spherical capacitor with two concentric spherical conductors. [8]
  - (b) An electric dipole located at the origin in free space has a moment. [8]  $\overrightarrow{P} = 3 \, \overrightarrow{a}_x - 2\overrightarrow{a}_y + \widehat{a}_z nCm.$

Find V at 
$$P_{A}(2, 3, 4)$$
. [8]

- 5. (a) Using Biot-Savart law, find magnetic field intensity, due to infinite long filament carrying current of 'I' amperes. [8]
  - (b) Magnetic vector potential is given by  $\overline{A} = -\frac{\rho^2}{4} \overline{a}_z$  Wb/m calculate total magnetic flux crossing the surface  $\phi = \frac{\pi}{2}, 1 \le \rho \le 2m, \quad 0 \le z \le 5m.$  [8]

Or

- 6. (a) State and explain the scalar and vector magnetic potential. [8]
  - (b) A circular loop located on  $x^2 + y^2 = 9$ , z = 0 carries a direct current of 10A long  $\hat{a}_{\phi}$ . Determine  $\overline{H}$  at (0, 0, 4) and (0, 0 -4). [8]

[5252]-6

#### SECTION II

- (a) Derive the boundary condition for steady electric field at an interface between two perfect dielectric materials. [10]
  - (b) A boundary exist at Z = 0 between two dielectrics  $\varepsilon_{r1} = 2.5$ in region Z < 0 and  $\varepsilon_{r2} = 4$  in region Z > 0. The field in the region  $\varepsilon_{r1}$  is  $\overline{E_1} = -30\hat{a}_x + 50\hat{a}_y + 70\hat{a}_z$  V/m. Find  $\overline{E_2}$  and  $\overline{D_2}$ . [8]

#### Or

- 8. (a) Derive the boundary conditions at an interface between two magnetic media having different magnetic permeabilities.[10]
  - (b) Region 1 is a semi-finite space in which 2x 2y > 0 while region 2 is defined by 2x - 5y < 0. Let  $\mu_{r1} = 3$ ,  $\mu_{r2} = 4$ and  $\overline{H_1} = 30 \hat{a}_x$  A/m. Find : [8]
    - (*i*)  $|\overline{\mathbf{B}_1}|$
    - $(ii) |\overline{\mathbf{B}_{n_1}}|$
    - $(iii) |\overline{\mathbf{H}_{t_1}}|$
    - $(iv) |\overline{\mathbf{H}_2}|.$

9. (a) State and explain Maxwell's equation for time varying fields in point form and integral form. [8]

(b) What is meant by uniform plane wave ? Explain transverse nature of electromagnetic wave. [8]

Or

10. (a) What is Poynting vector ? Derive the expression for total average power crossing any surface S. [8]

[5252]-6

- (b) In the charge free region, the magnetic field intensity is given by :  $\bar{H} = H_m \cos\beta z \cos\omega t \, \bar{a}_y \, A / m$ . Calculate  $\bar{E}, \bar{D}, \bar{B}$ .
- 11. (a) Explain with neat figures, finite difference method. [8]

(b) Discuss in detail method of moments. State its applications. [8]

- 12. (a) What are the different steps of finite element analysis of any problem ? [8]
  - (b) Explain method of images in detail. [8]

Total No. of Questions—12]

Seat	
No.	

### [5252]-7

### S.E. (Electrical) (Second Semester) EXAMINATION, 2017 MICROPROCESSOR FUNDAMENTALS AND ITS PROGAMMING

#### (2008 PATTERN)

**Time : Three Hours** 

Maximum Marks : 100

**N.B.** :- (i) Answer any **3** questions from each section.

- (*ii*) Answers to the two sections should be written in separate answer-books.
- (*iii*) Figures to the right indicate full marks.
- (iv) Assume suitable data, if necessary.

#### **SECTION-I**

- (a) Explain in detail the address bus, data bus and control bus of 8085 microprocessor with diagram. [10]
  - (b) What is "Addressing Mode"? Explain the various addressing modes of 8085 microprocessor. [8]

Or

- (a) Draw and explain in detail architecture of 8085 microprocessor.
   [10]
  - (b) List the registers in 8085 and explain their functions. [8]
- **3.** (a) Draw and explain the 4K ROM interfacing with 8085 from 0000H. [8]
  - (b) Write a program to find the largest number of given ten numbers which are stored from memory 4000H onwards. Store the result at 5000H location. [8]

4.	<i>(a)</i>	Explain the interrupt driven data transfer process and polling
		data transfer method. [8]
	( <i>b</i> )	What is memory mapping ? Differentiate I/O mapped I/O &
		memory map I/O. [8]
5.	( <i>a</i> )	Explain the data transfer techniques of 8085 microprocessor.
		[8]
	( <i>b</i> )	Draw and explain function block diagram of 8251. [8]
		Or
6.	<i>(a)</i>	Explain asynchronous serial data communication. What is baud
		rate ? [8]
	( <i>b</i> )	State various bus interface standards and explain in detail RS-
		232. [8]
		SECTION-II

- 7. (a) With the help of functional block diagram explain in detail 8254 PIT. [10]
  - (b) Explain Mode 0 operation of 8255 PPI in detail. [8] Or
- 8. (a) Draw and explain in detail functional block diagram of 8255 PPI. [10]
  - (b) Write a program to produce time delay of 5 ms in mode 1 of 8254 PIT. [8]
- 9. (a) Explain with the help of interfacing diagram the concept of measurement of frequency using 8085 microprocessor. [8]
  - (b) Explain the interfacing of DAC 0808 with 8085 microprocessor. [8]

[5252]-7

- **10.** (a) With the help of block diagram explain the measurement of current using 8085 microprocessor. [8]
  - (b) Explain with relevant block diagram the procedure of interfacing of ADC 0809 to 8085 microprocessor. [8]
- 11. (a) Explain the procedure to control the DC motor using 8085 microprocessor. [8]
  - (b) With the help of diagram explain the flow measurement with 8085 microprocessor. [8]

- 12. (a) With relevant interfacing diagram explain the temperature measurement using 8085 microprocessor. [8]
  - (b) Explain with a schematic diagram and flowchart how 8085 canbe used to control stepper motor. [8]

Total No. of Questions-12]

Seat	
No.	

### [5252]-8

### S.E. (Instrumentation&Cont.) (First Semester) EXAMINATION, 2017 PRINCIPLES OF SENSORS AND TRANSDUCERS (2008 PATTERN)

#### **Time : Three Hours**

Maximum Marks : 100

**N.B.** :— (i) All questions are compulsory.

- (*ii*) Answers to the two sections should be written in separate answer books.
- (ii) Neat diagrams must be drawn wherever necessary.
- (iii) Figures to the right indicate full marks.
- (iv) Use of logarithmic tables, slide rule, Mollier charts, electronic, pocket calculator and steam tables is allowed.
- (v) Assume suitable data, if necessary.

#### **SECTION-I**

- (a) Explain with proper example active, passive, primary and secondary transducer. [8]
  - (b) Explain selection procedure of sensor with example. [8] Or
- 2. (a) What is measurement ? Explain importanced of measurement.

[8]

(b) What is calibration ? Explain necessity of calibration. [8]

- (a) Explain gas in system thermometers along with application.
  - (b) State units of pressure measurement with conversion factor.Explain member to measure pressure. [9]

- **4.** (a) Explain cantilever beam type force sensors. [9]
  - (b) What is torque ? State and explain in brief any one application that requires torque measurement. Explain working of flat spiral spring with neat diagram. [9]
- **5.** (*a*) Explain Air bubbler system for level measurement. [8]
  - (b) Explain annubar for flow measurement. [8]

Or

- 6. (a) Explain Seabolt viscosity meter. [8]
  - (b) Explain application of Bourdon tube to measure viscosity.

[8]

[9]

#### **SECTION-II**

- (a) Explain working principle and construction of RTD with neat diagram. [9]
  - (b) What is strain ? How is it measured ? Draw quarter, half and full bridge configuration and explain advantages of one over other. [9]

Or

- 8. (a) Explain disappearing filament type optical pyrometer. [9]
  - (b) Explain how displacenebt can be measured with capacitive sensor with suitable diagram, supporting equations. [9]

[5252]-8

3.

9.	<i>(a)</i>	Explain Electrodynamic transducers for vibration measurem	ient.
			[8]
	( <i>b</i> )	Explain photoconductive transducers with working princ	iple,
		diagram and application.	[8]
		Or	
10.	<i>(a)</i>	Explain Ionization gauges working with neat diagram.	[8]
	( <i>b</i> )	Explain reference pH electrode.	[8]
11.	<i>(a)</i>	Explain digital readout system with neat sketch.	[8]
	( <i>b</i> )	Explain data display and recorder system.	[8]
		Or	
12.	<i>(a)</i>	Explain self-balancing recorder.	[8]
	( <i>b</i> )	Explain analogue readout with neat sketch.	[8]

Total No. of Questions—12]

[Total No. of Printed Pages-3

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No.	

### [5252]-9

S.E. (Instrumentation and Control) (First Semester) EXAMINATION, 2017 APPLIED ELECTRONICS

#### (2008 PATTERN)

#### Time : Three Hours

#### Maximum Marks : 100

- N.B. :- (i) Answer three questions from Section I and three questions from Section II.
  - (*ii*) Answers to the two sections should be written in separate answer-books.
  - (iii) Neat diagrams must be drawn wherever necessary.
  - (*iv*) Figures to the right indicate full marks.
  - (v) Your answer will be valued as a whole.
  - (vi) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam bables is allowed.
  - (vii) Assume suitable data, if necessary.

#### Section I

- 1. (a) Explain the operation of any *one* type of ADC with neat circuit diagram. [8]
  - (b) Describe the working of Multiplexer and DE multiplexer circuit. [10]

#### Or

- **2.** (a) Draw and explain Counter type ADC in detail. [8]
  - (b) Explain 2-bit flash type ADC using neat circuit diagram. [10]

(a) Explain binary weighted register type DAC using neat circuit diagram.

(b) Explain R-2R ladder type DAC using neat circuit diagram. [8]

#### Or

- **4.** (a) Explain Pulse Width Modulation type DAC with neat diagram. [8]
  - (b) Describe any two performance characteristics of DAC. [8]
- 5. (a) Draw the symbol of SCR and describe its working principle.
  [8]
  - (b) Draw the symbol of TRIAC and describe its working principle.
    [8]

#### Or

- 6. (a) Draw and explain symbols and operation of E-type or D-type MOSFET. [8]
  - (b) Draw and explain symbol and operation of DIAC. [8]

#### Section II

- 7. (a) Explain principle of charging and discharging in the battery.
  [8]
  - (b) Discuss the details of IC L-200 with neat diagrams. [10] Or
- 8. (a) Explain any one charging method for the battery. [8]
  (b) Write a short note on safety circuit inside lithium-ion battery pack. [10]

[5252]-9

 $\mathbf{2}$ 

9. Draw and explain Voltage Controlled Oscillator using IC 566. (*a*) [8] (b)Draw and explain the operation of phase lock loop. [8] Or Explain voltage to frequency (V/F) converter with neat 10. (*a*) [8] diagram. Explain frequency to voltage (F/V) converter with neat diagram. (b)[8] Explain the concept of Amplitude Modulation using neat 11. (*a*) diagrams. [8] Explain the concept of Frequency Modulation using neat (b)waveforms. [8] Or

# 12. (a) Explain the concept of Amplitude Shift Keying with neat diagrams. [8]

(b) What is Amplitude Division Multiplexing ? Describe with neat block diagram[8]

3

Total No. of Questions—12]

Maximum Marks : 100

Seat	
No.	

### [5252]-11

### S.E. (Instrument & Cont.) (Second Semester) EXAMINATION, 2017 PHOTONICS AND INSTRUMENTATION (2008 PATTERN)

#### Time : Three Hours

## **N.B.** :- (i) Answers to the *two* sections should be written in separate answer-books.

- (ii) Answer any three questions from each section.
- (iii) Neat diagrams must be drawn wherever necessary.
- (iv) Figures to the right side indicate full marks.
- (v) Use of calculator is allowed.
- (vi) Assume suitable data if necessary.

#### SECTION I

- 1. (a) Draw electromagnetic spectrum of light and show different ranges of visible, infrared, ultraviolet regions etc. [10]
  - (b) Compare : [6] Reflection and Refraction.

#### Or

- 2. Explain the following terms : [4×4]
  - (*i*) Scattering
  - (*ii*) Interference
  - (iii) Diffraction
  - (*iv*) Coherence.

- **3.** (a) With neat diagram explain any one gas discharge lamp. [10]
  - (b) What is Spectra ? Explain the types of spectra. [6]

- 4. (a) With neat diagram explain the construction and working of incandescent lamp. [10]
  - (b) For an incandescent lamp the design parameter are : [6]
    - (*i*) Design voltage = 5V
    - (*ii*) Design current = 0.145 Amp
    - (*iii*) M.S.C.P. at design voltage = 0.16
    - (iv) Lamp life = 10,000 Hrs

If this lamp is operated at 4.5 V, then calculate :

- (1) Rerated M.S.C.P.
- (2) Rerated life.
- (a) What do you understand by a term radiation pattern of emitting diode ? Suggest experimental set up and procedure to draw it.
  - (b) List out the different applications of LASER. [6]

Or

- 6. (a) Explain working of light emitting diode. Explain any two structures of LED. [12]
  - (b) With neat diagram explain semiconductor laser. [6]

#### [5252]-11

 $\mathbf{2}$ 

#### **SECTION-II**

7.	( <i>a</i> )	Compare Thermal and Quantum Detectors. [8]
	( <i>b</i> )	Explain with diagram Photomultiplier tube. [8]
		Or
8.	( <i>a</i> )	Explain any two types of Quantum detector with suitable
		diagram. [10]
	( <i>b</i> )	Explain in short charge coupled devices. [6]
9.	( <i>a</i> )	Explain the diffraction grating equation with its application
		suggest experimental set up to determine the unknown
	$(\mathbf{h})$	Write a short note on helemontic mating
	( <b>0</b> )	write a short note on holographic grating. [4]
		Ur
10.	(a)	Explain the types of filter with its applications. [4]
	( <i>b</i> )	Write short notes on : [3×4]
		(i) Beam Splitter
		( <i>ii</i> ) Prism
		( <i>iii</i> ) Lenses.
11.	Expla	ain working principle of the following with suitable diagram
	<i>(i)</i>	Astronomical Telescope
	(ii)	Camera. [9×2]
[5252	2]-11	3 P.T.O

- 12. (a) Draw the neat diagram of monochromator and explain functions of various components of monochromator. Which component contributes to the resolution of monochromator. [9]
  - (b) Explain with neat diagram optical projection system. [9]

Total No. of Questions—12]

Seat	
No.	

### [5252]-12

### S.E. (Instru./Cont.) (Second Semester) EXAMINATION, 2017 DRIVES & CONTROL

#### (2008 **PATTERN**)

#### Time : Three Hours

Maximum Marks : 100

- **N.B.** :- (i) Answer any **3** questions from each section.
  - (*ii*) Answers to the two sections should be written in separate answer-books.
  - (iii) Neat diagrams must be drawn wherever necessary.
  - (iv) Figures to the right indicate full marks.
  - (v) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (vi) Assume suitable data, if necessary.

#### Section I

- (A) Describe the basic principle of Generator. Explain with the help of a neat diagram the constructional details of DC generator. Write EMF equation for DC generator. [10]
  - (B) In a long shunt compound generator, the terminal voltage is
     230 V when generator delivers 150 A. Determine :
    - (i) Induced EMF
    - (*ii*) Total power generated.

Given that the shunt field, series field and armature resistances are 92 ohm, 0.05 ohm and 0.032 ohm respectively. [8]

- (A) Explain why DC series motor damages mechanically if it is started on no load. [6]
  - (B) Explain the three point starter in detail in shunt motor.
    - [6]
  - (C) A 220 V shunt motor has an armature resistance of 0.2 ohm and field resistance of 110 ohm. The motor draws 5 A at 500 rpm at no load. Calculate the speed and shaft torque if the motor draws 52 A at rated voltage.
- **3.** (A) Derive the torque equation for induction motor. [6]
  - (B) Why does rotor rotates in induction motor ? [4]
  - (C) Draw and write the relation between torque and slip. [6]

#### Or

- 4. (A) Explain the working and construction of alternator. [8]
  - (B) 3 phase induction motor is wound for 4 poles and is supplied from 50 Hz system. Calculate : [8]
    - (*i*) The synchronous speed
    - (*ii*) The rotor speed when slip is 4%
    - (iii) Rotor frequency when rotor runs at 600 rpm.
- 5. (A) Explain the working principle and construction of Universal motor. Explain the speed control methods. [8]
  - (B) Write a short note on servomotors. Write how the servomotors differ in application capabilities from industrial motors [8]

#### [5252]-12

- 6. (A) Write a working principle of stepper motors. Mention the two applications of it. Why the stepper motor is widely used in automation systems ?
  - (B) Why synchronous motor is not self starting ? Explain magnetic locking condition. [8]

#### Section II

- 7. (A) Explain forward conduction loss and turn off loss in SCR and also explain forward and reverse avalanche of SCR. [8]
  - (B) Explain in detail the construction of SCR and also the necessity of gate triggering in SCR. [8]

#### Or

- 8. (A) Write the construction, working and characteristics of UJT.[8]
  - (B) What is natural and forced commutation of SCR. Explain Class 'A' commutation of SCR. [8]
- 9. (A) Explain the working principle of full wave controlled rectifier with waveforms. [9]
  - (B) Draw the circuit diagram and explain the operation of step down chopper with the help of waveforms. [9]

#### Or

10. (A) Explain the single phase half-controlled bridge rectifier with RL load. Explain the necessity of flywheel diode. Draw the waveforms. [9]

3

(B) Write the short note on inverters. [9]

#### [5252]-12

- 11. (A) Write short notes on :
  - (i) Braking of induction motor
  - (ii) Three phase SCR drive in DC motor control.
  - (B) Explain the Dynamic breaking of separately excited dc motor. [6]

[10]

#### Or

- 12. (A) With the help of circuit diagram explain the working of single phase half-bridge inverter. [8]
  - (B) Give the methods by which speed of the induction motors can be varied. Explain any *one* in detail. [8]

Total No. of Questions-12]

[Total No. of Printed Pages-3

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No.	

### [5252]-13

### S.E. (Comp/IT) (First Semester) EXAMINATION, 2017 HUMANITIES AND SOCIAL SCIENCES

#### (2008 PATTERN)

#### Time : Three Hours

Maximum Marks : 100

- N.B. := (i) Answer *three* questions from section I and *three* questions from Section II.
  - (*ii*) Answers to the two sections should be written in separate answer-book.
  - (iii) Neat diagrams must be drawn wherever necessary.
  - (*iv*) Figures to the right indicate full marks.

#### Section-I

- (a) Define Sociology. Explain the importance of sociology. How does it differ from other social sciences. [10]
  - (b) State and explain Panchayat Raj Institutions in India with their objectives and functions. [8]

Or

- 2. (a) Briefly explain what do you mean by "Social Demography" ? How it influences the society. [9]
  - (b) Explain the concept of Secularism in India. [5]
  - (c) Define Institutions of Marriage. [4]

**3.** (a) Briefly explain the importance of National Policy on Education.

- (b) Explain the following concepts : [8]
  - (*i*) Cultural Lag,
  - (*ii*) Social change

#### Or

- 4. (a) State and explain the scientific approach to the study of human beings. [8]
  - (b) Write a short note on Industrial Revolution in India since independence. [8]
- (a) Explain the importance of technology on agriculture sector in the context of green revolution. Is green revolution successful in India ? Describe.
  - (b) Explain the importance of Public-Private sector partnership inIndia. Is it a feasible solution to the core sector industries? [8]

#### Or

 What are the strategies adopted by Indian industries for development? Explain with reference to infrastructure and communication industries. [16]

#### Section-II

7. (a) Explain in detail effects of Global warming and its consequences.

[8]

[8]

(b) What are the different types of pollutions. State and explain its impact on mankind. [8]

- 8. (a) What is biodiversity ? Explain the measures taken for protection of biodiversity. [8]
  - (b) What are the sources of conventional and non-conventional energy ? Explain.
- 9. (a) Define Demand. Explain Law of demand and supply. What are the assumptions and exceptions to law of demand ? [10]
  - (b) "Five Year Plans are integral part of economic development."Explain. [8]

Or

- 10. (a) Differentiate between micro and macro economics. [9]
  (b) Define Inflation. Explain the causes and effects of Inflation in economic development. [9]
- 11. (a) Explain the importance of various ratios for financial analysis.
  - (b) Explain the functioning of WTO. [8] Or

[8]

12. (a) Briefly explain the functions of RBI. [8]
(b) Define budget. Explain various types of budget. [8]

[5252]-13

3
Seat	
No.	

## [5252]-14

### S.E. (Computer Engineering) (I Semester), EXAMINATION, 2017 PROGRAMMING AND PROBLEM SOLVING (2008 PATTERN)

# Time : Three Hours Maximum Marks : 100 N.B. :- (i) In Section I, attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6.

- (ii) In Section II, attempt Q. No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10, Q. No. 11 or Q. No. 12.
- (*iii*) Answers to the two Sections should be written in separate answer-books.
- (iv) Neat diagrams must draw wherever necessary.
- (v) Figures to the right indicate full marks.
- (vi) Assume suitable data if necessary.

#### **SECTION-I**

- 1. (a) Explain the problem solving concepts for computer. [12]
  - (b) Define the data types of the following data items. Justify your answers : [4]
    - (i) Sum of money
    - (*ii*) Telephone No.

#### Or

- (a) Construct a logical expression for the following policy on using a departmental store charge card for a customer to charge an item is that : [6]
  - (i) Customer must have a valid charge card and
  - (ii) Balance of less than Rs. 500 or charge of less than

Rs. 50

	( <i>b</i> )	Explain problem analysis chart & structure chart of interactivity chart.
	( <i>c</i> )	Write rules for drawing flow charts. [2]
3.	( <i>a</i> )	What are the different types of modules are needed for the solutions to the problems ?
	<i>(b)</i>	Explain negative logic with suitable example. [6]
	(c)	Explain Decision table in detail with example. [6]
	(0)	Or
4.	(a)	Using positive logic, write the algorithm & draw the flow charts
		for the following set of condition. [6]
		Gross Salary Tax Rate
		Gross < = 5000 3%
		5001-8000 5%
		8001-10000 8%
		Gross = 10000 10%
	( <i>b</i> )	What are the different ways of send data in the modules?
		Explain with suitable example. [6]
	(c)	What do you mean by internal & external documentation
		Explain with suitable example. [6]
5.	(a)	Write Pseudo algorithm to compute the sum of squares of
		<i>n</i> numbers. [8]
	( <i>b</i> )	Given a number $n$ devise Pseudo algorithm to compute its
		square root. [8]
		Or
6.	<i>(a)</i>	Given some integer X, compute to value $X^n$ where n is positive
		integer which is greater than 1. [8]
	( <i>b</i> )	Design Pseudo algorithm that convert Binary Number to
[525	52]-14	2

Octal.

#### **SECTION-II**

- 7. (a) Write short notes on the following : [8]
  - (i) Table lookup Technique
  - (ii) Pointer Technique
  - (b) Write Pseudo algorithm to find minimum, maximum elements& how many times they both occur in an array of n elements.

Or

8. (a)Write a Pseudo algorithm to remove all duplicate from an ordered array. [8] *(b)* Write a Pseudo algorithm for partition a randomly ordered array of n elements into two subsets such that elements less than equal to X are in one subset & element are greater than X are in other subset. [8] 9. Explain algorithm for left-right justification of given text. (a)[8] *(b)* Write a pseudo algorithm to count number of characters in each line. [4] Explain search keyword from given text algorithm. [4] (c)Or10. Write Pseudo algorithm for liner pattern search. (a)[8] Explain algorithm for line editing. *(b)* [8] 11. (a)Distinguish between the following terms : [9] (i)**Objects & Classes** (ii)Constructor & Destructors (iii) Procedure-oriented & Object oriented programming *(b)* Explain essential characteristics of an object oriented programming language. [4] What do you mean by polymorphism? Explain with suitable (c)[5252]-143 P.T.O.

[8]

example.

Or

- (3) Balance amount in the account. (4)Member function : (1)to assign initial values (2)to deposit an amount (3)to with draw an amount after checking the balance (4)to display name & balance Write a main program to test the program for 'n' depositors. (*b*) Explain the following terms : [6] Static member function (1)Friend function. (2)Explain advantages & disadvantages of object oriented pro-(c)[4] gramming language. (d)What is the application of the scope resolution operators in C++ ? [2]
- (a)12. Define a class bank account having data members : [6]
  - (1) Name of the depositor
  - (2)Account No.
  - Type of account

[5]

Seat	
No.	

## [5252]-15

# S.E. (Comp. Engg.) (Second Semester) EXAMINATION, 2017 MICROPROCESSOR AND INTERFACING TECHNIQUES (2008 PATTERN)

#### **Time : Three Hours**

#### Maximum Marks : 100

- **N.B.** :- (i) Answer three questions from Section I and three questions from Section II.
  - (*ii*) Answers to the two sections should be written in separate answer-books.
  - (iii) Neat diagrams must be drawn wherever necessary.
  - (iv) Figures to the right indicate full marks.
  - (v) Assume suitable data, if necessary.

#### **SECTION-I**

1. (A) Draw and explain programmers' model of 8086 microprocessor.

[8]

(B) Explain with a neat diagram of memory segmentation in the 8086 microprocessor. [8]

Or

- 2. (A) List out the signals of the 8086 which have different meanings in minimum and maximum mode. [8]
  - (B) Explain the flags register with instruction affecting the flags.

[8]

- 3. (A) Explain the following addressing modes with one example each : [8]
  - (a) Direct Addressing
  - (b) Immediate Addressing
  - (c) Base Register Addressing
  - (d) Index Addressing.
  - (B) Explain with example the following instructions for 8086: [8]
    - (*a*) XCHG
    - (b) XLAT
    - (c) MUL
    - (d) LEA.

4. (A) Explain the following Assembler directives : [8]

- (*i*) ENDP & ENDM
- (*ii*) MODEL
- (iii) LABEL
- (*iv*) PUBLIC.
- (B) Explain the difference between near and far procedure of 8086 microprocessor. [8]
- 5. (A) What are the different components of MS-DOS? With the help of neat diagram, explain how MS-DOS gets loaded. [10]
  - (B) Draw and explain structure of PSP. [8]

- **6**. (A) What is the difference between DOS and BIOS calls ? [8] (B) Explain the command words/control words of 8259 in detail. [10]

#### **SECTION-II**

- 7. (A) Explain BSR & I/O mode of 8255 with appropriate control word formats. [8]
  - Draw a block diagram of 8255 PPI and explain in brief. **(B)** [10]

#### Or

- 8. (A) Compare asynchronous serial communication with synchronous communication. Draw the command instruction format of 8251 and explain it. [8]
  - (B) What are different methods of ADC ? Explain dual slope ADC with block diagram. [10]
- 9. Explain with the help of block diagram functioning of 8253 (A) in different programmable modes. [8]
  - Draw and explain the following 8279 commands : **(B)** [8]
    - Keyboard/display mode set command (i)
    - (ii)Read FIFO/sensor RAM command.

#### Or

10. Explain in brief how 8279 is used for keyboard/display interface (A) with a suitable example. [8]

3

[5252]-15

- (B) Explain the necessity of 8237 DMA controller. List the features of 8237 DMA controller. [8]
- 11. (A) Draw the maximum mode module of 8086 clearly showing address latches, transreceivers and clock generator. [8]
  - (B) Draw and explain the architecture of 8087 NDP. [8]

- 12. (A) Explain the use of 8284 and 8286 in interfacing memory with 8086. [8]
  - (B) Interface 8255 PPI with 8086 microprocessor in maximum mode.
     Draw interfacing diagram and mention address map for 8255.

[8]

[Total No. of Printed Pages-2]

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# [5252]-101

### S.E (Civil) (I Sem.) EXAMINATION 2017 BUILDING TECHNOLOGY AND MATERIALS (2012 PATTERN)

- Time : Two Hours
   Maximum Marks : 50

   N.B. :- (i)
   Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6

   Q. 7 or Q. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.
- (a) It is proposed to construct a residential building on black cotton soil. Which type of foundation is suitable in such condition? Comment with reasons. [6]
  - (b) What is underpinning ? Explain the Pit method with labeled figure. [6]
- 2. (a) Where is Coursed rubble masonry being used ? Explain course rubble masonry with a neat and labeled figure. [6]
  - (b) Enlist types of plastering. Explain advantages and limitations of gypsum plaster. [6]
- **3.** (a) With a neat and labeled figure explain chequer method of floor construction. [6]
  - (b) Draw a neat and labeled figure of semicircular arch. [6]

4. (a) Explain the advantage and disadvantage of flat roofs. [6]

(b) Explain with neat sketches any *three* types of hinges used for doors and windows. [6]

5.	<i>(a)</i>	Discuss the requirements of a good staircase with referen	nce
		to :	[7]
		(i) Location	
		(ii) Materials	
		(iii) Width and length of stair	
		(iv) Pitch of stair	
		(v) Headroom	
		(vi) Rise and Tread and	
		(vii) Number of steps in a flight.	
	( <i>b</i> )	Write a short note on wall cladding.	[6]
6.	(a)	Write short notes on :	[6]
		(i) Elevators	
		( <i>ii</i> ) Ramps.	
	( <i>b</i> )	Write a note on "Defects in Painting".	[7]
7.	(a)	Explain the precautions to be taken for storing materials	on
		site.	[6]
	( <i>b</i> )	What is shoring ? Explain Raking shores.	[7]
8.	(a)	Write short notes on :	[7]
		(i) Defects in timer	
		( <i>ii</i> ) Types of Glass and their properties used in construct	ion
	( <i>b</i> )	Write a note on Ceramic products in construction".	[6]

[Total No. of Printed Pages-4

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### [5252]-102

### S.E. (Civil) (I Sem.) EXAMINATION, 2017 STRENGTH OF MATERIALS (2012 PATTERN)

### Time : Two Hours

#### Maximum Marks : 50

- **N.B.** :- (i) Neat diagrams must be drawn wherever necessary.
  - (*ii*) Figure to the right indicate full marks.
  - (iii) Use of electronic pocket calculator is allowed.
  - (iv) Assume suitable data, if necessary.
  - (v) Answer Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or
     Q.No.6, Q.No.7 or Q.No.8.
- (a) Determine load 'P' and total elongation of the bar. Refer figure
   1.1. Assume E = 200 GPa. [6]



#### Figure 1.1

(b) A beam of cross-section 100 mm × 200 mm is simply supported at both ends. It carries two concentrated load of 100 kN each acting at 2m distance from each support span of the beam is 7 m. Determine the maximum bending stress induced in the beam.

2. (a) A reinforced concrete column 500 mm  $\times$  500 mm in section P.T.O.

is reinforced with 4 steel bars of 25 mm diameter one in each corner. The column is carrying a load of 1000 kN. Find the stresses in the concrete & steel bars. Take E for steel = 210 Gpa, E fro concrete = 14GPa. [6]

- (b) A timber beam of rectangular section is simply supported over a span of 5m & carries a uniformly distributed load of 3kN/mover the entire span. If the maximum shear stress is 7 MPa. If b = 2/3d. Find value of b & d. [6]
- 3. (a) A solid aluminum shaft 100 mm diameter is to be replaced by a hollow steel shaft having 100 mm outer diameter. The two shaft has same angle of twist per unit torque over the total length if shear modulus for steel = 3× shear modulus for aluminum. Find the inner diameter of the shaft. [6]

[6]

- (b) Draw Mohr's circle for :
  - (1) pure shear
  - (2) pure biaxial tension
  - (3) pure uniaxial compression
  - (4) pure uniaxial tension

#### Or

- 4. (a) A bar of 35 mm diameter stretches 3 mm under gradually applied load of 65 kN. If a weight of 2 kN is dropped on to a collar at the lower end of this bar through a height of 40 mm, calculate maximum instantaneous stress & elongation of bar. Assume E = 200 GPa.
  - (b) A bar of steel is 80 mm in diameter & 550 mm long. A tensile load of 100 kN is found to stretch the bar by 0.25mm. The same bar when subjected to a torque of 1.4 kNm is found to twist through 3<sup>o</sup>. Find the values of four elastic constant.[6]

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 $\mathbf{2}$ 

5. (a) Draw SFD & BMD for a simply supported beam as shown in figure 5.1 [7]





(b) Draw shearing force & bending moment diagram for a beam as shown in fig make maximum BMD. [6]



Figure 5.2

Or

6. (a) An overhang beam ABCDE is supported at A & D. DE = 1 m overhang BC = CD = 1 m, AB = 2 m. Position AB is subjected to UDL 16 kN/m. At C a point load of 20kN is acting. At E a point load 8 kN is acting. Draw SFD & BMD. Locate point of contra flexure calculate maximum Bending moment. Refer figure. 6.1 [7]



(b) The diagram shown in figure, shear force diagram for a beam which rests on two supports. Draw loading & bending moment diagram.

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- 7. (a) State four end condition of columns and draw neat sketches showing deflected shape & effective length. [6]
  - (b) A 4 m length of a tube has a buckling load of 2 kN when used as a column hinged at both ends. Calculate buckling load for 4.5m length of the same tube when used as column if :[7]
    - (1) both ends are fixed
    - (2) one end fixed & other is hinged.

- 8. (a) Explain core of the section & hence obtain a core section for hollow rectangular column of external & internal size BxD&bx d respectively. [7]
  - (b) A column support load of 400 kN as shown in figure. Find the stresses at the corner of the column at its base. (Refer figure 8.1)



Figure 8.1

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## [5252]-103

# S.E. (Civil) (First Semester) EXAMINATION, 2017 GEOTECHNICAL ENGINEERING

#### (2012 PATTERN)

Time : 2 Hours

Maximum Marks : 50

- N.B. :- (*i*) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Use of calculator is allowed.
  - (iv) Assume suitable data, if necessary
- 1. (a) Define shrinkage limit and describe its procedure with neat sketch. [6]

(b) Derive with usual notations, 
$$\rho = \frac{(1+\omega)G\rho_{\omega}}{1+e}$$
 [6]

Or

2. (a) State applications of flownet and solve the following : A homogeneous earthen dam, 20 m high is constructed on an impermeable foundation. Coefficient of permeability for dam material is 2.77 × 10<sup>-8</sup> m/s. The water level on reservoir side is 18 m from base of the dam and dry on the downstream end. Flownet drawn has 4 flow channels and 18 equipotential drops. Estimate the quantity of seepage per unit length in  $m^{3}/s$  through the dam. [6]

- (b) State and explain the factors affecting permeability with relations involved. [6]
- (a) Draw Mohr circle for unconfined compression test and explain how the shear strength parameters can be determined from the Mohr circle.
  - (b) Explain standard proctor compaction test with neat sketch of apparatus and moisture density relation curve. [6]

#### Or

- 4. (a) An unconfined compression test was conducted on undisturbed sample of clay. The sample had a diameter of 37.5 mm & was 80 mm long. The load at failure measured by the proving ring was 28N and the axial deformation of the sample at failure was 13 mm. Determine the unconfined compressive strength and undrained cohesion of soil. [6]
  - (b) State Boussinesq's formula for stress due to point load and explain significant depth with relation to pressure bulb. [6]
- (a) State the assumptions in Rankine's theory and explain active, passive and at rest state of plastic equilibrium. [7]
  - (b) Derive the relation for critical height of vertical excavation that can be made without any lateral support and determine it when soil has density,  $\gamma = 18 \text{ kN/m}^3$ , C = 14 kN/m<sup>2</sup>,  $\phi = 12^{\circ}$ . [6]

- 6. (a) Derive the active thrust on retaining wall when uniform surcharge acts on horizontal ground surface with neat sketch.
  - (b) A smooth vertical wall retains a level backfill with  $\gamma = 18$  kN/m<sup>3</sup>,  $\phi = 33^{\circ}$  and c = 0 to a depth of 8 m. Draw the lateral earth pressure diagram and compute the total active earth pressure showing its point of application. [6]
- (a) Explain how Taylor's stability number is used for slope stability analysis. A slope is to be constructed at an inclination of 30<sup>o</sup> with the horizontal. Soil has following properties, c = 18kN/m<sup>2</sup>, φ = 20<sup>o</sup> and γ = 20kN/m<sup>3</sup>. The stability number is 0.0625. Determine the safe height of slope if the factor of safety is 1.5.
  - (b) State methods of remediation for soil contamination and explain any *two* of them.

- 8. (a) Explain process of contaminant transport and how soil acts as a geochemical trap. [6]
  - (b) How are slopes classified ? Also explain the considerations for slope stability for finite and infinite slopes. [7]

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No.	

# [5252]-104

Maximum Marks : 50

### S.E. Civil (First Semester) EXAMINATION, 2017 SURVEYING

#### (2012 PATTERN)

#### Time : Two Hours

(a) Enlist the methods of plane table surveying. Give *two* limitations of each method. [6]

(b) Following readings were observed during a reciprocal leveling with one level.[6]

Instrument at	Staff Rea	dings on	Remark	
	Р	Q		
Р	0.656	2.097	Distance between	
Q	0.867	2.298	A and B is 950 m	

Find :

- (a) the true R.L. of B, if R.L. of A = 378.650 m.
- (b) the combined correction due to curvature and refraction.
- (c) the error in the collimation adjustment of the instrument.

#### Or

2. (a) Find the included angles of the closed traverse PQRSTP and correct them for the corrections, if any. [7]

Line	PQ	QR	RS	ST	ТР
F.B.	242°00'	89°45'	70°00'	292°45'	20°00'
B.B.	63°00'	270°15'	250°00'	112°45'	198°30'

(b) The eye of an observer is 7 m above the sea level. He was able to see the top of a light-house 42 m high just at the P.T.O.

level of the horizon. Determine the distance of the observer from the light house. [5]

- **3.** (a) Explain the following terms : [6] Vertical axis, Horizontal axis, Optical Plumet, Telescope normal.
  - (b) Two tangents intersect at chainage of 1000 m with deflection angle of 55°. Calculate the chainage of T1 & T2, Length of long chord (L), Degree of curve (D), Apex distance, Mid ordinate distance, for setting out a curve with radius of 400 m. [6]

4. (a) ABCDA is a closed traverse. Determine the missing data in the following table : [6]

5.

**6**.

Line	AB	BC	CD	DA
Length (m)	230.5	250.2		427
Bearing	N36°45'E	S82°48'E		N82°45'W

*(b)* What are transition curves ? Give its necessity. [6] (a)Enlist various permanent adjustments of a theodolite. Explain procedure to correct any one. [5] *(b)* A tacheometer with constants K = 100, C = 0.3 was used to observe the following readings : [8] Instrument at Staff at Vertical angle Staff Readings Ρ  $+ 5^{\circ}15'$ 1.355, 2.580, 3.935 Α Q - 4°15' 0.985, 1.660, 2.335Determine the RL of Q. Take R.L. of P = 100.000 m. Also determine distance PQ if horizontal angle  $PAQ = 60^{\circ} 30'$ . Or (a)Explain the procedure to find techeometric constants on

- field. [4](b) Derive the distance and elevation formulae for an inclined line
- of sight with angle of elevation and staff is vertical. [5] 2

Or

(c)

Instrumentat	Staff at	Distance(m)	Vertical Angle	Cross hair reading
Р	A	80	2°30'	1.325, 2.122
Р	В	140	1°36'	0.985, 2.382

Determine the techeometric constants from the given data.[4]
7. (a) What is total station ? What are the types of total station ? [6]
(b) Describe the method of laying alignment of drainage line.[7] Or

8. (a) Explain the procedure for survey project on sanitary scheme.[6]

(b) Write a short note on the features of ETS.

[7]

Seat	
No.	

# [5252]-105

### S.E. (Civil) (First Semester) EXAMINATION, 2017 ENGINEERING MATHEMATICS-III (2012 PATTERN)

#### **Time : Two Hours**

### Maximum Marks : 50

- **N.B.** :- (i) Neat diagrams must be drawn wherever necessary.
  - (ii) Figures to the right indicate full marks.
  - (*iii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (iv) Assume suitable data, if necessary.

#### **1.** (a) Solve any two of the following :

(i)  $\frac{d^3y}{dx^3} - 7\frac{dy}{dx} - 6y = e^{2x}(1+x)$ 

(*ii*) 
$$x^2 \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} + 5y = x^2 \sin(\log x)$$

(*iii*) Use the method of variation of parameters to solve the linear differential equation :

$$\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}.$$

(b) Solve the following system of linear equations by Gauss Elimination method : [4]

$$2x + y + z = 10$$
  

$$3x + 2y + 3z = 18$$
  

$$x + 2y + 9z = 34$$

P.T.O.

[8]

**2.** (a) Solve the system of simultaneous symmetric equations : [4]

$$\frac{dx}{y-z} = \frac{dy}{z-x} = \frac{dz}{x-y}$$

(b) Apply Runge-Kutta method of 4th order to solve the differential equation : [4]

$$\frac{dy}{dx} = \frac{y-x}{y+x}, \ y(0) = 1$$

to find y(1) with h = 1

(c) Solve the following system of equations by Cholesky method : [4]

$$2x - y = 1$$
$$-x + 3y + z = 0$$
$$x + 2\tilde{z} = 0$$

$$y + 2z = 0$$

linear regression estimate of x, given y = 10.

**3.** (a) Given the following information :

	Variable x	Variable y
Arithmetic mean	8.2	12.4
Standard deviation	6.2	20
Coefficient of correlation between	x and $y$ is	0.9. Find the

[4]

- (b) A coin is so biased that apearance of head is twice likely as that of tail. If a throw is made 6 times, find the probability that at least 2 heads will appear. [4]
- (c) If the directional derivative of  $\phi = axy + byz + czx$  at (1, 1, 1) has maximum magnitude 4 in a direction parallel to x-axis, find the values of a, b, c. [4]

#### Or

(a) The first four moments of a distribution about the value 5 are 3, 30, 50 and 60. Obtain the first four central moments and coefficient of Skewness and Kurtosis. [4]

(b) Prove the following (any one) :

(i) 
$$\nabla \left(\frac{\overline{a} \cdot \overline{r}}{r^n}\right) = \frac{\overline{a}}{r^n} - \frac{n(\overline{a} \cdot \overline{r})}{r^{n+2}}\overline{r}$$
  
(ii)  $\nabla \times (\overline{r} \times \overline{u}) = \overline{r} (\nabla \cdot \overline{u}) - (\overline{r} \cdot \nabla \overline{u})$ 

$$(ii) \quad \nabla \times (\overline{r} \times \overline{u}) = \overline{r} (\nabla \cdot \overline{u}) - (\overline{r} \cdot \nabla)\overline{u} - 2\overline{u} .$$

(c) Show that 
$$\overline{F} = (ye^{xy}\cos z)\overline{i} + (xe^{xy}\cos z)\overline{j} - e^{xy}\sin z\overline{k}$$
 is  
irrotational. Find corresponding scalar  $\phi$ , such that  $\overline{F} = \nabla \phi$ . [4]

5.

(a)

Find the work done in moving a particle along 
$$x = a \cos\theta$$
,  
 $y = a \sin \theta$ ,  $z = b\theta$  from  $\theta = \frac{\pi}{4}$  to  $\theta = \frac{\pi}{2}$  under a field  
of force given by,

$$\overline{\mathbf{F}} = -3a\sin^2\theta\cos\theta \stackrel{\rightarrow}{i} + a(2\sin\theta - 3\sin^3\theta)\stackrel{\rightarrow}{j} + b\sin2\theta\,\overline{k}\,.$$
 [4]

(b) Evaluate 
$$\iint_{S} (\nabla \times \overline{F}) \cdot d\overline{S}$$
 for  $\overline{F} = y\overline{i} + z\overline{j} + x\overline{k}$  where S is the surface of paraboloid  $z = 1 - x^2 - y^2$ ,  $z \ge 0$  using Stokes' theorem. [4]

(b) Given that :

$$\iiint_{\rm V} \frac{1}{r^2} \, d{\rm V} = \iint_{\rm V} \frac{1}{r^2} \, \overline{r} \, . \, d\overline{\rm S},$$

where S is closed surface enclosing the volume V. Hence evaluate  $\iint_{S} \frac{x\overline{i} + y\overline{j} + z\overline{k}}{r^{2}}, d\overline{S}$  where S is surface of sphere  $x^{2} + y^{2} + z^{2} = a^{2}.$  [5]

6. (a) Using Green's theorem show that the area bounded by a simple closed curve C is given by 
$$\frac{1}{2}\int (xdy - ydx)$$
 hence find the area of ellipse  $x = a \cos \theta$ ,  $y = b \sin \theta$ . [4]

[5252]-105

[4]

(b) Evaluate :

$$\iint_{\mathbf{S}} (\nabla \times \overline{\mathbf{F}}) \, . d\overline{\mathbf{S}}$$

where  $\overline{F} = (x^3 - y^3)\overline{i} - xyz\overline{j} + y^3\overline{k}$  and S is the surface  $x^2 + 4y^2 + z^2 - 2x = 4$  above the plane x = 0. [4]

(c) Evaluate

 $\iint \overline{r} \, . \, \hat{n} dS,$ 

over the surface of the sphere of radius 2 with centre at origin. [5]

(a) A homogeneous rod of conducting material of length 100 cm has its ends kept at zero temperature and the temperature initially is :

$$u(x, 0) = x, 0 \le x \le 50$$
  
= 100 - x, 50 \le x \le 100

Find the temperature u(x, t) at any time.

(b) A rectangular plate with insulated surface is 10 cm wide and so long to its width that it may considered infinite in length without introducing an appreciable error. If the temperature of short edge y = 0 is given by :

[6]

$$u(x, 0) = 20x$$
 for  $0 \le x \le 15$ 

= 20 (10 - x), for  $5 \le x \le 10$ 

and the two long edges x = 0, x = 10 as well as other short edge are kept at 0°C. Find the temperature u(x, y) at any ponit (x, y). [7]

- Or
- 8. (a) A tightly stretched string with fixed ends x = 0 and x = lis initially in a position given by :  $y(x, 0) = y_0 \sin^3 \left(\frac{\pi x}{l}\right)$ . If it is released from rest from this

position, find the displacement y at any distance x from one end at any time t. [6]

(b) An infinitely long plane uniform plate is bounded by two parallel edges x = 0 and x = π and an end rt. angles to them. The breadth of the plate is π. This end is maintained at temperature u<sub>0</sub> at all points and other edges at zero temperatures. Find steady state temperature function u(x, y). [7]

Seat	
No.	

## [5252]-106

# S.E. (Civil Engineering) (Second Semester) EXAMINATION, 2017 FLUID MECHANICS—I

#### (2012 PATTERN)

#### Time : Two Hours

Maximum Marks : 50

- N.B. :- (i) Answer any six questions from Q. No. 1 or 2, Q. No.
  3 or 4, Q. No. 5 or 6, Q. No. 7 or 8, Q. No. 9 or 10,
  Q. No. 11 or 12.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right side indicate full marks.
  - (iv) Use of calculator is allowed.
  - (v) Assume suitable data if necessary.
- Differentiate between surface tension and capillarity. Give practical examples of each. Derive the relation showing the capillary rise or fall depends upon on surface tension. [5]

Or

- 2. (a) A fluid a specific gravity of 0.83 and a kinematic viscosity of  $4 \times 10^{-4}$  m<sup>2</sup>/s. What is its absolute viscosity in S.I. units ? [3]
  - (b) Define mass density, specific weight, specific volume, relative density.

- 3. (a) A wooden block 50 cm long, 25 cm wide and 18 cm deep has its shorter axis vertical with the depth of immersion 15 cm. Calculate the position of the metacentric and comment on the stability of the block. [3]
  - (b) State and explain Pascal's law. [2]

- **4.** (a) Define Buoyancy and centre of Buoyancy. [2]
  - (b) A vertical square area  $1 \text{ m} \times 1 \text{ m}$  is submerged in water with upper edge horizontal and 0.5 m below water surface. Locate a horizontal line on the surface such that the force on the upper portion equals the force on the lower portion. [3]
- 5. (a) Obtain a stream function to the following velocity components. U = x + y and v = x - y [3]
  - (b) Distinguish between uniform and non-uniform flow. Give at least one example of each. [2]

- 6. (a) Check whether  $\psi = (y^2 x^2)$  function is possible irrotational flow field. [3]
  - (b) Define Stream lines and equipotential lines. Give at least *one* example of each. [2]
- 7. (a) Write all the assumptions made in derivation of Bernoulli's equation. [2]
  - (b) What do you understand by "energy correction factor α"? Write the expression for it. [3]

- 8. (a) Define coefficient of velocity, coefficient of discharge and coefficient of resistance for an orifice. [3]
  - (b) Write short note on Pitot tube [2]

Or

- 9. (a) Explain Laminar sublayer. What is Boundary Layer separation and its control ? [5]
  - (b) The velocity distribution in the boundary layer is : [6]

$$\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$$

 $\delta$  = thickness of boundary layer.

Calculate Displacement thickness and Momentum thickness

(c) What do you understand by Reynolds number ? How is it connected with the types of flow ? [4]

Or

- 10. (a) A smooth float plate with a sharp leading edge is placed at zero incidence in a free stream of water flowing at 3.5 m/s. Determine the distance from the leading edge where the transition from laminar to turbulent flow may commence. Take viscosity of water as 0.01 poise. Also calculate boundary layer thickness at the transition point. [6]
  - (b) Prove that the momentum thickness and energy thickness for boundary layer flow are given by : [5]

$$\phi = \int_{0}^{\theta} \frac{u}{U} \left( 1 - \frac{u}{U} \right) dy \quad \text{and}$$

$$\partial e = \int_{0}^{\partial} \frac{u}{U} \left( 1 - \frac{u^2}{v^2} \right) dy$$

(c) Explain Stakes' law and state its assumptions. [4]

11. (a) In a pipe of diameter 100 mm carrying water the velocities at the pipe centre and 20 mm from the pipe centre are found to be 2.5 m/s and 2.3 m/s respectively. Find the wall shear stress.

[5252]-106

- (b) Explain any *four* characteristics of turbulent flow. [4]
- (c) Derive an expression for "loss of head due to sudden enlargement" in case of flow through a pipe. [6]
   Or
- 12. (a) For turbulent flow through a pipe 60 cm in diameter, the velocities are 4.5 m/s and 4.2 m/s on the centre line and at a radial distance of 10 cm from pipe axis. Calculate the discharge in the pipe. [5]
  - (b) Explain in brief : Instantaneous velocity and Temporal mean velocity. [4]
  - (c) Write short note on Prandtl's mixing length theory and Hydrodynamically smooth and rough pipes. [6]

**Time : Two Hours** 

[Total No. of Printed Pages-3

Seat	
No.	

## [5252]-107

Maximum Marks : 50

### S.E. (Civil) (Second Semester) EXAMINATION, 2017 ARCHITECTURAL PLANNING AND DESIGN OF BUILDINGS (2012 PATTERN)

N.B. :— (i) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, on answer-book.

- (ii) Solve Q. No. 5 or Q. 6, Q. No. 7 or Q. No. 8 on drawing sheet.
- (iii) Assume suitable data if necessary.
- (iv) Figures to the right indicate full marks.

 (a) Write a note on 7/12 abstract, elaborating the importance and meaning of every term on it. [7]

- (b) Write notes on : [6]
  - (i) Circulation and
  - (*ii*) Contrast.

#### Or

2.	( <i>a</i> )	Explain the utility of 6-D forms. [6
	( <i>b</i> )	What is "fire load" ? Explain the means for "fire protection
		in brief. [7
3.	( <i>a</i> )	Explain one pipe and two pipe plumbing system with sketch
		[6
	( <i>b</i> )	What is "F.A.R." ? Mention about the areas to be exempted
		while calculating F.A.R. [6

**4.** (a) What factors affect, designing and planning of electrical services ? [6]

- (b) Enlist the objectives of Framing "D.C. Rules". [6]
- 5. Draw the developed plan for a line plan given (Refer. Fig. 1). External and internal wall thickness = 150 mm. Find max. horizontal and max. vertical dimension. [10+3=13]



 $\mathbf{2}$ 

- 6. Draw <u>line plans</u> for a G+1 storeyed bungalow with the following details. Also indicate clearly locations of doors, windows and ventilators (if any) with its schedule : Ground floor : Living room = 18 m<sup>2</sup>, kit and Din = 15 m<sup>2</sup>, Master bed with attached toilet 18 m<sup>2</sup>, with provision of W.C./Bath, staircase First Floor : Common room — 18 m<sup>2</sup>, Bedroom —18 m<sup>2</sup> and WC/Bath + Terrace. [5+5+3=13]
- 7. Draw a line plan for a post office with the following data : [12]
  - (i) Counters width 0.7 m; 6 in no.
  - (*ii*) Working area for staff 40  $m^2$
  - (iii) Post Master's room with toilet  $18 \text{ m}^2$
  - (iv) Separation room 40 m<sup>2</sup>
  - (v) Cash transaction + Safe custody area 40  $m^2$
  - (vi) W.C. Male/Female 9 m<sup>2</sup> each.

- 8. Draw a line plan for a hostel building with the following details : [12]
  - (i) Entrance + Moving space around -2.5 m wide.
  - (*ii*) Two seated rooms 7.5 m<sup>2</sup>/seat
  - (*iii*) Recreation Hall and dining hall.  $3 \text{ m}^2$ /seat for both.
  - (iv) Kitchen/Store min. width 3 m.
  - (v) Sanitary block, parking space, other facilities as per requirements;
    - [for 50 students—]

Seat No.

## [5252]-108

# S.E. (Civil Engineering) (Second Semester) EXAMINATION, 2017 CONCRETE TECHNOLOGY

### (2012 **PATTERN**)

Time : Two HoursMaximum Marks : 50

N.B. := (i) Answer Q. 1 or 2, Q. 3 or 4, Q. 5 or 6, Q. 7 or 8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (*iii*) Figures to the right indicate full marks.
- (iv) Your answers will be valued as a whole.
- (v) Use of electronic pocket calculator is allowed.
- (vi) Assume suitable data, if necessary.
- (vii) Use of IS code 10262,456 is not allowed.
- **1.** (a) Which are the field tests to be carried out on cement ?

[6]

(b) Define workability. State and explain the factors affecting workability. [6]

Or

- (a) Enumerate the different tests carried on aggregates. State the significance and procedure of aggregate crushing value test.
  - (b) What are the factors affecting strength of concrete ? [6]

- 3. (a) State the various types of non-destructive tests carried on hardened concrete. Explain "Rebound hammer test with its limitations". [6]
  - (b) Describe the different types of vibrators used for compaction of concrete. [6]

- **4.** (a) Write short notes on :
  - (i) Fiber reinforced concrete
  - (*ii*) Self compacting concrete.
  - (b) Define Ferrocement. Explain the basic concepts in forming ferrocement composition used in the construction industry.

[6]

[4]

[6]

- 5. (a) What do you mean by nominal mix, standard mix and design mix ?
  - (b) Explain mix design by IS recommended guidelines in detail.Write the procedure of standard mixes. [7]

### Or

- **6.** (a) Explain the factors governing the selection of mix proportions.
  - (b) What do you mean by : [4]
    - (i) Mean strength
    - (*ii*) Variance
    - (*iii*) Standard deviation
    - (iv) Coefficient of variation
  - (c) Briefly outline the DOE method of mix design. [5]

#### [5252]-108

 $\mathbf{2}$ 

- (a) State and explain the factors affecting permeability of concrete.
   What measures should be taken to reduce permeability of concrete ? [5]
  - (b) Write short notes on :
    - (*i*) Evaluation of crack
    - (*ii*) Selection of repair procedure. [8]

- 8. (a) Explain the process of preparation of surface for repairs along with its importance. [5]
  - (b) Write short notes on : [8]
    - (*i*) Carbonation of concrete
    - (*ii*) Retrofitting by FRP.

Seat	
No.	

Time : Two Hours

### [5252]-109

# S.E. (Civil) (Second Semeter) EXAMINATION, 2017 STRUCTURAL ANALYSIS—I

### (2012 **PATTERN**)

Maximum Marks : 50

- $N.B. := (i) \text{ Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6,} \\ \text{and Q. 7 or Q. 8.}$ 
  - (ii) Neat sketches must be drawn wherever necessary.
  - (iii) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.
  - (v) Use of electronic pocket calculator.
  - (vi) Use of cell phone is prohibited in the examination hall.
- (a) Determine maximum slope and deflection for cantilever of span
   L loaded with uniformly distributed load w per unit length. [6]
  - (b) Determine moment at B for the continuous beam loaded and supported as shown in Fig. 1 (b) by three moment theorem. Assume uniform flexural rigidity. [6]



Fig. 1 (b)
- (a) Determine the propped reaction for the propped cantilever loaded with uniformly distribute load w on entire span L by strain energy method.
  - (b) Determine the fixed moment for the fixed beam loaded and supported as shown in Fig 2 (b).[6]



3. (a) Find the vertical displacement of joint C for the pin jointed truss as shown in Fig. 3 (a). The cross-sectional area of the members AC and CB are 1500 mm<sup>2</sup> and the areas of the members AB is 1000 mm<sup>2</sup>. Take E = 200 kN/mm<sup>2</sup>. [6]



 $\mathbf{2}$ 

(b) Draw influence line diagrams for axial forces in the members  $U_2U_3$ ,  $L_2U_3$  and  $L_2L_3$  of the through type bridge truss of height 4 m as shown in Fig. 3 (b). [6]



## Fig. 3 (b)

Or

4. (a) A simply supported beam is loaded and supported as shown in Fig. 4 (a). Determine shear and moment at D by influence line diagram.



Fig. (a)

(b) Find forces in members of the indeterminate truss as shown in Fig. 4 (b) by strain energy method. Cross-sectional area and material of all members is same.



Fig. 4 (*b*)

- 5. (a) A three hinged parabolic arch of horizontal span 48 m has a central rise of 10 m. It carries a uniformly distributed load 20 kN per horizontal meter run over the middle 16 m length of the span. Calculate the radial shear force, Normal thrust at 20 m from the left support. [6]
  - (b) A two-hinged parabolic arch of span L and central rise y is loaded with a concentrated load W at the crown. Determine the horizontal thrust at the support. [7]

### Or

6. (a) A circular arched rib of 20 m span with central rise of 4 m is hinged at crown and springing. It carries a point load 100 kN at 5 m from the left hand hinge. Determine horizontal thrust, reaction at supports and moment under point load.
[6]

- (b) A two-hinged semicircular arch of uniform section is hinged at the abutments which are at the same level. It carries a point load W at the crown. Show that the horizontal thrust at the abutment is W/π. [7]
- (a) A simply supported beam AB of span L loaded with central point load W. Determine collapse load by static and kinematic method.
  - (b) A 4 m span beam fixed at both ends is loaded with uniformly distributed load 10 kN/m on entire span. Determine the plastic moment.
     [7]

Or

- 8. (a) Explain idealized stress-strain curve for mild steel in tension. [5]
  - (b) Determine the collapse load for the frame shown in Fig. 8 (b) assuming uniform  $M_p$  for all members. [8]



Fig. 8 (*b*)

Total No. of Questions-8]

Seat	
No.	

# [5252]-110

### S.E. (Civil Engineering)(Second Semester)

### EXAMINATION, 2017

### **ENGINEERING GEOLOGY**

### (2012 PATTERN)

### Time : Two Hours

- **N.B.** :— (i) Solve/Write the answers to any *four* questions in single answer-book only.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.
- (a) What are Sedimentary Rocks ? Distinguish between White sandstone and Ferrugenous Sandstone. [6]
  - (b) What is overlap ? Describe inlier and outlier with neat sketches.

Or

- 2. (a) What is Metamorphism ? Describe two-parallel textures represented by metamorphic rocks. [6]
  - (b) What is folding ? Give nomenclature of the fold. Describe any two types of folds.[6]

### P.T.O.

### Maximum Marks : 50

(a) Describe any *three* features developed by River Erosion.

[6]

(b) Why observations and precautions are necessary in the core drilling process ?

### Or

- **4.** (a) Write a note on 'physiographic divisions of India'. [6]
  - (b) How nature of the rocks can be assessed on number of pieces present in one RUN ? [6]
- (a) Describe any two geological conditions leading to natural springs.
   [7]
  - (b) Write notes on feasibility of Tunelling through : [6]
    - (*i*) Anticline
    - (*ii*) Syncline.

#### Or

- 6. (a) Explain with appropriate example feasibility of dam alignment across a fracture. [7]
  - (b) Explain the product of volcanoes. [6]
- (a) What are Natural and Artificial causes of Landslides ? Enlist measures to prevent landslide. [7]
  - (b) What Geological studies are required to be carried out in reservoir area of proposed dam site. [6]

[5252]-110

3.

8. (a) What are Core Recovery and RQD ? On the basis of the following data calculate core recovery and RQD. [7]

Run in Meters	Piece no.	Length of each piece in 'cm'	Nature of Fracture	Remark
		r	at lower end	
3 m to 6 m	1	10	М	Granite
	2	09	J	rocks
	3	09	Μ	
	4	30	J	
	5	34	J	
	6	51	J	
	7	55	J	
	8	60	J	
	9	42	J	

(b) Describe feasibility of dam in folded areas. Draw neat diagrams.

3

[6]

Or

Total No. of Questions-8]

Seat	
No.	

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## S.E. (Prod/Prod.Sand/Indust./Automob./Mech) (First Semester) EXAMINATION, 2017 ENGINEERING MATHEMATICS-III (2012 PATTERN)

### Time : Two Hours

### Maximum Marks : 50

- N.B.: (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (*iv*) Use of logarithmic tables, Non-programmable electronic pocket calculator is allowed.
  - (v) Assume suitable data, if necessary.

1. (a) Attempt any two of the following : [8]  
(i) 
$$(D^2 - 1)y = (1 + x^2)e^x$$
  
(ii)  $(D^2 + 4)y = 4.\sec^2(2x)$ , By variation of parameters.  
(iii)  $(2x + 1)^2 \frac{d^2y}{dx^2} - 2.(2x + 1)\frac{dy}{dx} - 12y = 6x$   
(b) Find Fourier transform of : [4]  
 $f(x) = \begin{cases} 1, |x| \le a \\ 0, |x| > a \end{cases}$ 

2. (a) A body of weight W = 3N, stretches a spring to 15 cm. If the weight is pulled down to 10 cm below the equilibrium position and then given a downward velocity 60 cm/sec. Determine the amplitude, period and frequency of motion. [4] P.T.O.

(b) Solve any one of the following :

(i) Find Laplace transform of : [4]

$$f(t) = \{t \cdot e^{3t} \cdot \sin(2t)\}$$

(ii) Find Inverse Laplace transform of

$$f(s) = \log\left(\frac{s+4}{s+8}\right).$$

(c) Solve the following differential equation by Laplace transform method : [4]

$$(D^3 - 1)y = e^t$$
, given that  
 $y(0) = 0, y'(0) = 0, y''(0) = 0$ 

- 3. (a) Find the directional derivative of  $\phi = e^{2x-y-z}$  at (1, 1, 1) in the direction of the tangent to the curve  $x = e^{-t}$ , y = 2 $\sin t + 1$ ,  $z = t - \cos t$  at t = 0. [4]
  - (b) Show that  $\overline{F} = (2xz^3 + 6y)\overline{i} + (6x 2yz)\overline{j} + (3x^2z^2 y^2)\overline{k}$  is irrotational and find  $\phi$  such that  $\overline{F} = \nabla \phi$ . [4]

(c) Find the coefficient of correlation for the following data : [4]

x		У
152		198
158		178
169		167
182		152
160		180
166		170
	Or	

[4]

4. (a) Prove any one of the following :

(*i*)  $\nabla \cdot \left(\frac{\overline{a} \times \overline{r}}{r}\right) = 0$ 

(*ii*) 
$$\overline{b} \times \nabla[\overline{a}, \nabla \log r] = \frac{\overline{b} \times \overline{a}}{r^2} - \frac{2(\overline{a}, \overline{r})}{r^4} (\overline{b} \times \overline{r})$$

*(b)* In a shooting competition, the probability of a man hitting a target is  $\frac{1}{5}$ . If he hits the target for 5 times, what is the probability of hitting the target at least two times ? [4] (c)Calculate the first four moments about the mean of the given distribution and find  $\beta_1$  and  $\beta_2$ . [4]

x	f
5	4
7	6
13	17
24	25
29	18
36	12

5. Find the work done by (a) $\overline{\mathbf{F}} = x^2 \hat{i} + y z \hat{j} + z \hat{k}$ in moving a particle along the straight line joining from (1, 2, 2) to (3, 4, 4).

Apply Stokes' theorem to evaluate  $\int_{C}^{C} (y \, dx + z \, dy + x \, dz)$  where (*b*) C is the curve of intersection of  $x^2 + y^2 + z^2 = 1$ and x + z = 1.[5]

[4]

[4]

(c)Show that :

$$\iint \frac{\overline{r}}{r^3} \cdot \hat{n} \, ds = 0$$

$$Or$$

6. (a) If 
$$\overline{F} = \frac{-y\hat{i} + x\hat{j}}{x^2 + y^2}$$
, then show that :  
$$\int_{C} \overline{F} \cdot d\overline{r} = 2\pi$$

where C is a circle containing the origin. [4] 3 P.T.O. [5252]-111

(b) Evaluate :

$$\iint_{\mathbf{S}} \left( x^3 \hat{i} + y^3 \hat{j} + z^3 \hat{k} \right) . d\overline{\mathbf{S}}$$

over the surface of the sphere  $x^2 + y^2 + z^2 = 1$ . [5]

[4]

(c) Using Green's theorem, evaluate

$$\int_{\mathcal{C}} \overline{\mathcal{F}} \, . \, d\overline{r}$$

where  $\overline{\mathbf{F}} = y^3 \hat{i} - x^3 \hat{j}$  and C is the circle  $x^2 + y^2 = a^2, z = 0$ .

7. Solve any two :

(a) Solve the boundary value problem :

$$\frac{\partial^2 y}{\partial t^2} = 4 \frac{\partial^2 y}{\partial x^2}; \text{ given } y(0, t) = y(5, t) = 0;$$
$$y(x, 0) = 0; \left(\frac{\partial y}{\partial t}\right)_{t=0} = 5 \sin \pi x \text{ in } 0 \le x \le 5.$$
[7]

(b) Solve :

$$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}.$$

If :

(i) u is finite for all t

(*ii*) 
$$u(0, t) = 0; \forall t$$
  
(*iii*)  $u(l, t) = 0; \forall t$   
(*iv*)  $u(x, 0) = u_0; \quad 0 \le x \le l$   
where *l* being a length of a bar. [6]

[5252]-111

4

(c) Solve :

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

with conditions

(i) 
$$u = 0$$
 when  $y \to +\infty$ , for all  $x$   
(ii)  $u = 0$  when  $x = 0$  for all  $y$   
(iii)  $u = 0$  when  $x = 1$ , for all  $y$   
(iv)  $u = x(1 - x)$  when  $y = 0$  for  $0 \le x \le 1$ . [6]  
Or

8. Solve any two :

- (a) A string is stretched and fastned to two points distance l apart is displaced into the form  $y(x, 0) = 3 (lx x^2)$  from which is released at t = 0. Find the displacement x from one end. [7]
- (b) Solve :

$$\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}$$

if :

(*i*) 
$$u(0, t) = 0$$

$$(ii) \quad u(l, t) = 0$$

(*iii*) u(x, t) is bounded and

$$(iv) \quad u(x, 0) = \frac{u_0}{l}x \text{ for } 0 \le x \le l.$$
 [6]

(c) An infinitely long uniform metal plate is enclosed between lines y = 0 and y = 1 for x > 0. The temperature is zero along the edges y = 0; y = 1 and at infinity. If the edge x = 0 is kept at a constant temperature u<sub>0</sub>, find the temperature u(x, y).

Total No. of Questions-8]

Seat	
No.	

# [5252]-112

Maximum Marks : 50

# S.E. (Automobile/Mechanical Engineering) (First Semester) EXAMINATION, 2017

### MANUFACTURING PROCESSES—I

### (2012 **PATTERN**)

### **Time : Two Hours**

- **N.B.** :— (i) Neat figures must be drawn whenever necessary.
  - (ii) Solve Q. No. 1 or Q, No. 2, Q. No. 3 or Q. No. 4, Q.
    No. 5 or Q. No. 6. Q. No. 7 or Q. No. 8.
  - (iii) Neat diagrams must be drawn wherever necessary.
  - (iv) Assume suitable data if necessary.
- (a) Explain with neat sketch Permanent molding method ? State applications of Permanent molding method. [4]
  - (b) What is "Fettling" in casting ? Explain in detail. [4]
  - (c) Explain Lost-Wax casting process in detail. [4]

### Or

- 2. (a) Describe the pattern making allowances. What is the use of contraction rule ? [4]
  - (b) Explain with suitable sketch the test performed to find grain fineness number. [4]
  - (c) What is continuous casting ? Describe in detail with figure the continuous casting process. [4]

- **3.** (a) Explain hot piercing and Hot spinning process in brief. [4]
  - (b) Write short note on shot pining. Explain the applications of shot pining. [4]
  - (c) Explain with neat sketch cluster rolling mills. [4]

- 4. (a) Explain cold drawing process in brief. [4]
  - (b) Differentiate between hot working and cold working. [4]
  - (c) Explain electric arc welding with a neat diagram. [4]
- 5. (a) The washer of 30 mm outer diameter and 15 mm inner diameter are to be made by press work from MS sheet of 1 mm thickness. Determine : (i) Clearance (piercing die and punch sizes (blanking die and punch sizes. Assume suitable data if required.
  - (b) Design press tonnage required for blanking a square plate having its side 40 mm<sup>2</sup> and have a central hole of diameter 15 mm, the sheet metal thickness is 2.5 mm and shear strength of material is 360 N/mm<sup>2</sup>. Calculate die and punch dimensions. Consider the clearance of 10% of stock thickness. [7]

6. (a) Explain compound die with neat sketch. [6]

(b) Why are strippers required ? List various types of strippers and explain any *one* with neat sketch.

### [5252]-112

 $\mathbf{2}$ 

- 7. (a) Calculate the amount of offset of tail stock for turning taper on full length of a job 100 mm long to have its two diameters as 50 mm and 40 mm. [7]
  - (b) Write a short note on taper turning by tailstock set over method with proper expression. [6]

### Or

- 8. (a) With a block diagram of lathe machine, explain size and specification of Lathe machine. [7]
  - (b) Differentiate between Capstan and Turret lathe with diagram.

[6]

•

Total No. of Questions-8]

Seat	
No.	

# [5252]-113

## S.E. (Mechanical/Automobile/Sandwich) (First Semester) EXAMINATION, 2017 THERMODYNAMICS (2012 PATTERN)

### **Time : Two Hours**

## Maximum Marks : 50

- N.B. :- (i) Solve 4 questions, Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.
  - (*ii*) Answer for the *four* questions should be written in same answer book attach supplement if required.
  - (iii) Neat diagrams should be drawn wherever necessary.
  - (*iv*) Use of steam tables, Mollier charts, scientific calculator is allowed.
  - (v) Use of pocket calculator & different gas charts as applicable is allowed
  - (vi) Assume suitable data if necessary.
  - (vii) Figures to the right indicate full marks.
- (a) State the limitations of first law of Thermodynamics and state Kelvin Planck and Clausius statement of the second law of thermodynamics. Draw Heat Engine, Heat Pump and Refrigerator principle and formula for calculating its performance. [6]
  - (b) The volume of a given container is 40 m<sup>3</sup> containing Air. The initial pressure and temperature of the Air is 1 bar, 25 deg.
    C. Mass of Air inside the container is released till the cylinder

pressure and temperature becomes 0.4 bar, 5 deg. C. Estimate the mass of Air in kg discharged to the atmosphere. R = 287 J/kg K for Air. [6]

Or

- 2. (a) Derive the relation for heat transfer and work transfer for isothermal process. [6]
  - (b) In a steam plant, 1 kg of water per second flows steadily to the boiler. The enthalpy and velocity of water entering the boiler are 800 kJ/kg and 5 m/s. The water receives 2200 kJ/kg of heat in the boiler at constant pressure. The steam after passing through the turbine comes out with a velocity of 50 m/s, and its enthalpy is 2520 kJ/kg. The inlet is 4 m above the turbine exit. Assuming the heat losses from the boiler and the turbine to the surroundings are 20 kJ/s, calculate the power developed by the turbine. Consider the boiler and turbine as single system.
- 3. (a) Derive the relation for efficiency for Brayton gas power cycle. [6]
  (b) A vessel having a volume of 0.6 m<sup>3</sup> contains 3.0 kg of liquid water and water vapour mixture in equilibrium at a pressure of 0.5 MPa. [6]
  Calculate :
  - (i) Mass and volume of liquid
  - (ii) Mass and volume of vapour.

Or

- 4. (a) Discuss the principle of separating Calorimeter with a neat diagram. [6]
  - (b) An inventor claims that a new heat cycle will develop
     0.4 kW for a heat addition of 32.5 kJ/min. The temperature of heat source is 1990 K and that of the sink is 850 K. Is his claim true.

- 5. (a) Discuss the Boiler plant layout indicating location of various accessories and water, air and flue gas circuit. [6]
  - (b) 5400 kg of steam is produced per hour at a pressure of 750 kPa in a boiler when feed water is at 41.5 deg. C. The dryness fraction of the steam is 0.98. The amount of the coal burnt per hour is 670 kg with CV of 31000 kJ/kg. Determine the boiler efficiency and equivalent evaporation. [7]

### Or

- 6. (a) Show in tabular form boiler heat balance sheet and the formulas involved for estimating each component. [6]
  - (b) A boiler is equipped with a chimney of 24 m height. The ambient temperature is 25 deg. The temperature of flue gases passing through the chimney is 300 deg. C. If the air flow through the combustion chamber is 20 kg/kg of fuel burned, find :
    - (i) The theoretical draught in cm of water column and
    - (ii) The velocity of the flue gases passing through the chimney if 50% of the head is lost in friction. [7]
- 7. (a) Derive the relation for minimum amount of air required per kg of fuel for complete combustion. [6]
  - (b) The percentage composition by mass of a solid fuel used in a boiler is given below : [7] C = 90%,  $H_2 = 3.5\%$ ,  $O_2 = 3\%$ ,  $N_2 = 1\%$ , S = 1% remaining is ash. Find the mass of air required for complete combustion and mass analysis of dry products of combustion.

Or

8. (a) Discuss the construction and working of Boys gas Calorimeter with neat sketch and thus derive the formula for HCV in Boys gas calorimeter. [6]

[5252]-113

(b) The following observations were made during the test for finding the lower CV of a solid fuel with the help of Bomb Calorimeter : [7]
Mass of fuel = 0.78 gm, Mass of fuse wire = 0.02 gm, CV of fuse wire = 6500 kJ/kg, Mass of Calorimeter water = 1.88 kg, Water equivalent of Calorimeter = 0.37 kg. Observed temperature rise = 3 deg. C. Mass of condensate collected 0.2808 gm.

Total No. of Questions—8]

Seat No.

## [5252]-114

# S.E (Mechanical/Automobile) (I Semester) EXAMINATION, 2017 MATERIAL SCIENCE

### (2012 PATTERN)

- Time : Two Hours
   Maximum Marks : 50

   N.B. :-- (i)
   Solve Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No.7 or Q.No. 8.
  - (*ii*) Figures to the right indicate full marks.
  - (iii) Draw the neat sketch wherever necessary.
- 1. (a) What do you mean by space lattice ? Write any *three* imperfections in crystals/lattices with example of each. [4]
  - (b) What is plastic deformation in materials ? Differentiate between slip and twinning. [4]
  - (c) What do you mean by isostress and isostrain condition in composite materials ? Calculate the composite modulus for polyester reinforces with 60 volume % E-glass under isostrain conditions. (Take Young modulus for polyester 6.9 GPa and for glass it is 72.4 GPa). [4]

Or

- (a) What do you mean by the term 'Polymer' ? Differentiate between Thermoplastic and Thermosetting polymers. [4]
  - (b) What do you mean by Composite Materials ? Explain with its types and classification. [4]
  - (c) What do you mean by "True stress and True Strain in Materials" ?Derive the relationship between both of it. [4]

- (a) What is the difference between Hardness and Toughness of the material ? Explain any two Testing methods for checking the hardness of the material with their principle of working and mathematical formula for calculation. [5]
  - (b) What is Notch Toughness in Impact Test ? List out the factorsby which the Impact values of materials get affected. [4]
  - (c) What do you mean by 'Non-destructive Testing ? Explain Radiography Method of Testing with working Principle, Advantages & Applications. [4]

### Or

- 4. (a) Identify the methods of material testing in the following cases : [5]
  - (i) To Measure Hardness of cast components, heterogeneous materials like cast irons and porous powder metallurgy components.
  - (*ii*) To measure the properties like electrical conductivity, magnetic permeability, grain size, heat treatment conditions, hardness and physical dimensions.
  - (*iii*) To test large sized, uniform thickness and one/many components at the same time.
  - (iv) In quality control test for detecting internal defects such as cracks, porosity and laminations in metallic and nonmetallic components during or after the production.
  - (v) Materials working for a continuous high temperature service under stressed conditions such as jet engine components, gas and steam turbines, nuclear reactors and tungsten filaments for electric bulbs.

- (b) Expalin the working principle of Fatigue Test Machine ? What are the different protection methods of fatigue life ? [4]
- (c) What do you mean by the term 'creep fracture' ? What are the requirements for creep resistant materials ? [4]
- 5. (a) Define the term 'powder metallurgy' ? List out its various applications specifying example for each of them. [5]
  - (b) What are the various properties of powder material that should be evaluated in powder metallurgy process ? [4]
  - (c) What are the steps involved in the production of a 'refractory materials' using powder metallurgy ? [4]
    - Or
- 6. (a) Explain the classification of various processes used to manufacture the powder in powder metallurgy process. [5]
  - (b) What do you mean by sintering of metal powders ? Explain with purpose and different processing stages ? [4]
  - (c) What are the steps involved in the production of a 'diamond impregnated tools' using powder metallurgy ? [4]
- 7. (a) Explain the following terms (any two) : [4]
  - (*i*) Biomaterials
  - (*ii*) Shape memory alloy
  - (*iii*) Superconductors
  - (b) What do you mean by the term Piezometric materials ? Explain with types.
  - (c) Explain the Magnetic Material. Differentiate Between Hard and Soft magnetic Materials. [4]

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3

Or

8.	( <i>a</i> )	Explain	the	following	terms	(any	two)	•	[4	]
----	--------------	---------	-----	-----------	-------	------	------	---	----	---

- (*i*) Nanomaterials
- (*ii*) Biosensors
- (iii) Dielectric materials
- (b) Explain the concept of smart materials and its Cryogenic applications. [4]
- (c) Explain 'The Modern materials for high temperature applications'. [4]

Total No. of Questions-8]

Seat	
No.	

# [5252]-115

# S.E. (Mechanical/Automobile Engg.) (I Sem.) EXAMINATION, 2017 FLUID MECHANICS

### (2012 PATTERN)

### Time : Two Hours

Maximum Marks : 50

- N.B. :- (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 and Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right indicate full marks.
  - (iv) Use of electronic pocket calculator is allowed.
  - (v) Assume suitable data, if necessary.
- (a) Explain the phenomenon of capillarity. Obtain an expression for capillary rise of a liquid. [6]
  - (b) The greatest and the least depth of a circular plate below the free surface of water are 4 m and 2 m respectively. Diameter of the plate is 4 m. Determine the total pressure on one face of the plate and the position of centre of pressure. [6]

### Or

2. (a) The dynamic viscosity of an oil, used for lubrication between a shaft and sleeve is 6 poise. The shaft is of 0.4 m

diameter and rotates at 190 rpm. Calculate the power lost in the bearing for a sleeve length of 90 mm. Thickness of oil film is 1.5 mm. [6]

- (b) Derive the continuity equation for three dimensional, steady, incompressible flow of fluid in cartesian co-ordinates. [6]
- 3. (a) State and prove Bernoulli's equation. What are the limitations of Bernoull's equation ? [6]
  - (b) A 20 cm × 10 cm venturimeter is inserted in a vertical pipe carrying oil of specific gravity 0.8. The oil flows in upward direction. The difference of levels between the throat and inlet section is 50 cm. The oil mercury differential manometer gives a reading of 30 cm of mercury. Find the discharge of oil. Neglect losses.

### Or

- (a) Prove that the maximum velocity in a circular pipe for viscous flow is equal to two times the average velocity of the flow. [6]
  - (b) Oil flows with a maximum velocity of 2 m/s between two horizontal parallel fixed plates which are 100 mm apart. Determine : [6]
     (i) The pressure gradient

(*ii*) The shear stress at the two horizontal parallel plates and(*iii*) The discharge per meter width.

Take  $\mu = 2.4525$  Pa-s. Assume flow to be laminar.

5. (a) Explain in brief the physical significance of : [6]
(i) Reynolds' number

(*ii*) Froude number

(iii) Mach number.

(b) Explain the concept of equivalent pipe and derive Dupit's equation. [7]

### Or

- 6. (a) The discharge Q over a small weir is known to depend upon the head 'H' over a weir the weir height 'P', gravity 'g', width of the weir 'L', fluid density 'ρ', dynamic viscosity 'µ' and surface tension 'σ'. Express the relationship between the variables in the dimensionless form. [7]
  - (b) Two reservoirs containing water have difference of levels of 70 m, and are connected by a 250 mm diameter pipe which is 4 km long. The pipe is tapped midway between reservoirs and water is drawn at the rate of 0.04 m<sup>3</sup>/sec. Assuming friction factor = 0.04, determine rate at which water enters in the lower reservoir. [6]
- 7. (a) Explain the development of boundary layer over a flat plate held parallel to the direction of flow. State the factors affecting growth of boundary layer. [6]
  - (b) A jet plane which weighs 29.43 kN and having a wing are of 20 m<sup>2</sup> flies at a velocity of 950 km/hr, when the engine delivers 7357.5 kW power. 65% of the power is used to overcome the drag resistance of the wing. Calculate the coefficients of lift and drag for the wing. Take density of air as 1.21 kg/m<sup>3</sup>. [7]

- Or
- 8. (a) Define displacement thickness. Derive an expression for displacement thickness. [6]
  - (b) Experiments were conducted in a wind tunnel at 50 kmph on a flat plate of size of 2 m  $\times$  1 m. The specific weight of air is 11.28 N/m<sup>3</sup>. The plate is kept at such an angle that the coefficient of lift and drag are 0.75 and 0.15 respectively. Determine lift force, drag force, resulting force and power exerted by air stream on plate. [7]

Total No. of Questions-4]

Seat	
No.	

# [5252]-116

Maximum Marks : 50

## S.E. (Mechanical/Mech Sand/Auto) (II Semester) EXAMINATION, 2017 THEORY OF MACHINES-I (2012 PATTERN)

### **Time : Two Hours**

**N.B.** :- (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.

- (ii) Neat diagrams must be drawn whenever necessary.
- (*iii*) Figures to the right indicate full marks.
- (iv) Use of calculator is allowed.
- (v) Assume suitable data whenever necessary.

1. (a) Explain working of Ackermann Steering gear mechanism. [5]

 (b) A connecting rod is suspended from a point 30 mm above the small end and 600 mm above its CG. It makes 20 oscillations in 35 second. Find dynamically equivalent two mass when one mass is placed at small end center. Take mass of connecting rod as 30 kg.

Or

2. (a) Explain T-θ diagram of a 4-stroke single cylinder engine. [5]
(b) Match the following : [5]

### Column A

Spherical Pair

(*ii*) Four Revolute Pairs

(i)

### Column B

- (i) Peaucellier Mechanism
- (ii) Force and Motion
- (iii) Completely Constrained Motion (iii) Forces Only
- (iv) Link of Structure
- (v) Straight Line Mechanism
- (iv) Planar Mechanism
- (v) Shaft with Collar at Both End in a Round Hole

[6]

- **3.** (a) With the help of neat sketch explain working of internal expanding shoe brake [4]
  - (b) Two shafts are connected by a Hook's joint, angle between them is 25°.[6]

Find :

- (i) Minimum and Maximum speed of driven shaft
- (*ii*) Rotation angle of the driving shaft where speed of driving and driven shaft are same

Take rotational speed of driving shaft as 800 rpm.

### Or

4. (a) A multi disc clutch transmits 60 kW of power at 1500 rpm. Axial intensity of pressure not to exceed 160 kN/m<sup>2</sup>. The internal radius 80 mm and is 0.65 times the external radius. Find the number of plates needed to transmit the required torque.

Take coefficient of friction 0.1

- (b) Write a loop closure equation for offset slider crank mechanism. [4]
- 5. (a) A mechanism is shown in Fig. 1, determine velocity of E of the bell crank lever by ICR method  $O_1A = 100 \text{ mm}, O_3C = 200 \text{ mm}, O_2D = 200 \text{ mm}, AC = 700 \text{ mm}, O_2E = 400 \text{ mm}.$

BD = 150 mm, BC = 200 mm

Crank O<sub>1</sub>A rotates at uniform speed of 100 rad/s. [12]



Fig. 1. (a)

(b) Explain velocity image principle. [3]

Or

6. In the mechanism shown in Fig. 2, the crank OA rotates uniformly at 5 rad/s. for the given configuration. Determine acceleration of slider D. Also determine angular acceleration of link AB and CD Various link lengths are :

Crank  $O_1A$  is 30 mm and makes angle of 45° with horizontal, AB = 65 mm,  $O_2B$  = 50 mm,  $O_2C$  = 50 mm, BC = 60 mm, CD = 85 mm,  $O_1O_2$  = 65 mm. [15]



Fig. 2

 In a Whitworth quick return motion mechanism shown in Fig. 3 OA rotates at 30 rpm in clockwise direction.

The dimensions of various links are :

OA = 150 mm, OC = 100 mm, CD = 125 mm and DR = 500 mm. Determine the acceleration of the sliding block R and the angular acceleration of the slotted lever CA. [15]



Fig. 3

Or

- 8. (a) In an 1C engine mechanism crank rotates at 250 rpm in clockwise direction. Length of the crank is 150 mm and obliquity ratio is 5. when the crank turned through 40° from IDC. Determine : [12]
  - (*i*) Velocity of Piston
  - (ii) Acceleration of the piston
  - (iii) Angular velocity and acceleration of connecting rod
  - (iv) If angular acceleration of the crank is 100 rad/s.
  - Use Klien's construction.
  - (b) Write a short note on Coriolis component of acceleration. [3]

Total No. of Questions—8]

Time : Two Hours

Seat	
No.	

# [5252]-118

Maximum Marks : 50

## S.E. (Automobile/Mechanical Engineering) (Second Semester) EXAMINATION, 2017 APPLIED THERMODYNAMICS

### (2012 PATTERN)

N.B. :- (i) Solve Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and Q. 7 or Q. 8.

- (*ii*) All the *four* questions should be solved in *one* answer-book and attached extra supplements if required.
- (iii) Draw neat and labelled diagrams wherever necessary.
- (iv) Use of Steam Tables, Mollier Charts and scientific calculator is allowed.
- (v) Assume suitable data wherever necessary.
- (vi) Figures to the right side indicate full marks.
- 1. (a) Explain any *three* factors affecting the combustion phenomena of spark ignition engines in detail. [6]
  - (b) Draw ideal and actual valve timing diagram for two stroke petrol engine. [6]

### Or

- 2. (a) Explain with the help of a p-V diagram the loss due to variation of specific heats in an Otto cycle. [6]
  - (b) Explain nozzle lip with a neat diagram in simple carburetor.[6]

- 3. (a) Enlist various factors that influence the delay period in CI engine. [6]
  - (b) The air flow to a four cylinder four-troke engine is 2.15 m<sup>3</sup>/ min. During a test on the engine the following data were recorded :

Bore = 10.5 cm Stroke = 12.5 cm Engine speed = 1200 rpm Torque = 150 N-m Fuel consumption = 5.5 kg/h Calorific value of fuel = 43124 kJ/kg Ambient temperature = 20°C Ambient pressure = 1.03 bars Calculate :

- (i) The brake thermal efficiency.
- (*ii*) The brakes mean effective pressure.
- (*iii*) The volumetric efficiency. [7]

Or

- 4. (a) Discuss the effect of the following engine variables on delay period in CI engine : [6]
  - (*i*) Inlet temperature
  - (*ii*) Inlet pressure
  - (iii) Compression ratio
  - (b) In a four stroke single cylinder gas engine the indicated mean effective pressure =  $0.46 \text{ MN/m}^2$ , the brake power = 9 kW,

speed = 250 rpm, mechanical efficiency = 0.8, and bore to stroke ratio = 0.66. Calculate cylinder diameter and mean piston speed. [7]

5. (a) Write a short note on Battery ignition system. [6]
(b) Write a short note on Emission control methods for SI and CI engines. [6]

### Or

- 6. (a) Write a short note on splash and Circulating Pump Lubrication System. [6]
  - (b) Write a note on Air pollution due to IC engine and its effect. [6]
- 7. (a) What are the advantages of multi-staging in reciprocating air compressor ? [6]
  - (b) A reciprocating air compressor has four stage compressions with 2 m<sup>3</sup>/min of air being delivered at 150 bar when initial pressure and temperature are 1 bar, 27°C. Compression occur polytropically following polytropic index of 1.25 in four stages with perfect inter-cooling between stages. For the optimum inter-cooling conditions determine the intermediate pressures and the work required for driving compressor. [7]

Or

8. (a) Compare reciprocating compressors with rotary compressors. [6]

(b) During an experiment on reciprocating air compressor the following observations are being taken : Barometer reading = 75.6 cm Hg, Manometer reading across orifice = 13 cm Hg. Atmospheric temperature = 25°C. Diameter of orifice = 15 mm. Coefficient of discharge across the orifice = 0.65 Take density of Hg = 0.0135951 kg/cm<sup>3</sup> Determine the volume of free air handled by compressor in m<sup>3</sup>/min. [7] Total No. of Questions-8]

[Total No. of Printed Pages-3

Seat	
No.	

# [5252]-120

# S.E. (Mechanical, Mech. Sandwich & Automobile) (Second Semester) EXAMINATION, 2017 ELECTRONICS AND ELECTRICAL ENGINEERING (2012 PATTERN)

### Time : Two Hours

- N.B. :- (i) Answer Questions 1 or 2, 3 or 4, 5 or 6, 7 or 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.
- (a) Draw the block diagram of 8051 microcontroller to showcase its architecture. [6]
  - (b) Explain the special function registers of 8051 microcontroller in brief. [6]

### Or

- 2. (a) Explain parallel data transfer scheme in detail. [6]
  (b) Draw and explain the serial interface of 8051 microcontroller with computer. [6]
- (a) Explain any two types of starters for three phase induction motor.

P.T.O.

### Maximum Marks : 50
(b) A 250 V, 4 pole lap wound DC shunt motor takes no-load current of 4 A when running at 1200 r.p.m. The resistance of armature winding is 0.1 Ω and shunt field winding is 125 Ω. The brush drop is 2 V. If it takes current of 61 A on full-load, calculate its full load speed. Assume that flux gets weakened by 5% on full-load condition due to armature reaction.

[7]

#### Or

- 4. (a) Explain the necessity of starter for DC motor. Draw and explain three-point starter. [6]
  - (b) A 3-phase, 4-pole, 50 Hz induction motor is supplied by 400 V supply. Its full load slip is 4%. At full load, stator copper losses are same as rotor copper losses. Stator iron losses are 25% of stator copper losses. Neglecting rotor iron losses, mechanical losses are one-third of no load losses. Full load output is 50 HP. Calculate the efficiency on full load. [7]
- 5. (a) Write difference between analog and digital instruments. [6]
  (b) With the help of neat diagram explain digital frequency counter. [6]

Or

6. (a) Explain working of digital multimeter with the help of block diagram.

 $\mathbf{2}$ 

- (b) Explain audio oscillators with the help of diagram. [6]
- (a) Explain two wattmeter method for measuring three-phase power with the help of neat circuit diagram and phasor diagram.
   Explain effect of power factor on wattmeter readings. [7]
  - (b) Explain Wien's bridge for frequency measurement. [6]

- 8. (a) Explain Maxwell's Induction-Capacitance bridge with neat diagram [7]
  - (b) Three coils each having resistance of 10 Ω and inductance of 0.02 H are connected in star across 440 V, 50 Hz supply. If two wattmeters are connected to measure power, determine (1) phase voltage (2) line current (3) reading of both wattmeters.

[6]

Total No. of Questions—8]

[Total No. of Printed Pages-3

Seat No.

## [5252]-121

# S.E (Mechanical Sandwich) (I Semester) EXAMINATION, 2017 MATERIAL SCIENCE AND METALLURGY

### (2012 PATTERN)

### Time : Two Hours

### Maximum Marks : 50

- $N.B. := (i) \quad \text{Solve question no. 1 or 2, question no. 3 or 4, question} \\ \text{no. 5 or 6, question no. 7 or 8.}$ 
  - (*ii*) Figures to the right indicate full marks.

(*iii*) Draw neat, well labelled sketch wherever necessary.

- 1. (a) What is the role of grain boundary in crystalline materials ? Explain\grain size measurement". [4]
  - (b) What is precipitation hardening ? Illustrate with suitable example. [4]
  - (c) Define "toughness". What are the methods to evaluate toughnessof a material ? [5]

#### Or

# **2.** (a) Explain in brief ultrasonic test. [4]

- (b) What is "Intergranular corrosion"? How can it be reduced? [5]
- (c) What is creep ? How to improve the creep resistance ?[4]
- 3. (a) Draw and label Fe-Fe3C phase equilibrium diagram. Show the critical temperatures. [4]
  - (b) Draw microstructure of a slowly cooled medium carbonS steel.What are its properties and applications ? [4]

(c) Explain in brief "Carbo Nitriding" process. What are its advantages ?[4]

#### Or

- 4. (a) What is "austempering" ? What are its advantages ? [4]
  (b) Classify in brief different stainless steels. [4]
  - (c) Why chromium is added in alloy steels ? Explain the effect of chromium % on mechanical properties of alloy steel. [4]
- **5.** (a) Explain in brief "sintering" process of metal powders. [4]
  - (b) Write a short note on carbide tip tools. [4]
  - (c) What is the common name of Cu-Zn alloy ? What are the effects of Zn % on properties of Cu-Zn alloy ? [5]

#### Or

- 6. (a) What is powder conditioning ? Write short note. [4]
  - (b) What is LM series of alloys ? Give composition and properties with one application of LM-6. [4]
  - (c) Explain in brief the importance of copper in white metal babbitts.[5]
- (a) What are thermoplastics ? Illustrate any *one* thermoplastic material with its "mer" structure. Give its applications. [4]
  - (b) What is RCC ? Why is it called a multiple composite ?[4]
  - (c) What are "ceramics"? Give examples of any *two* different materials used for thermal and electrical insulation which belong to "ceramics" class. What are their advantages ? [4]

#### Or

8. (a) What are "particulate composites"? Illustrate with sketch, any one such composite. [4]

#### [5252]-121

 $\mathbf{2}$ 

- (b) Which class of material is sensitive to ultra violet rays ? Explain in brief "radiation damage". [4]
- (c) Suggest the suitable material for any *four* of following applications. Justify your selection :
  - (*i*) Safety helmet
  - (*ii*) Contact lenses
  - (iii) Crain hook
  - (*iv*) Transformer Core
  - (v) Crank shaft of IC engine
  - (vi) Electrical contact brush.

Total No. of Questions—8]

Seat	
No.	

# [5252]-122

### S.E. (Mechanical Sandwich)(First Semester) EXAMINATION, 2017 FLUID MECHANICS AND MACHINERY

### (2012 **PATTERN**)

### Time : Two Hours

Maximum Marks : 50

- **N.B.** :- (i) All questions are compulsory.
  - (ii) Answers should be written in same books.
  - (iii) Neat diagrams must be drawn wherever necessary.
  - (iv) Figures to the right indicate full marks.
  - (v) Your answers will be volued as a whole.
  - (vi) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (vii) Assume suitable data, if necessary.
- (a) 3.5 m<sup>3</sup> of a certain oil weighs 29.5 kN. Calculate its specific weight, specific mass, specific volume and specific gravity. If kinematic viscosity of the oil is 6 × 10<sup>-3</sup> stokes, what would be the dynamic viscosity in centipoises ? [5]
  - (b) Derive the general continuity equation in three dimensions.[7]

Or

**2.** (a) The velocity potential function  $(\phi)$  is given by an expression : [8]

$$\phi = \frac{xy^3}{3} - x^2 + \frac{x^3y}{3} + y^2$$

- (i) Find the velocity components in X and Y direction.
- (*ii*) Show that  $\phi$  represents a possible case of flow.
- (b) Define total pressure and centre of pressure. [4]

P.T.O.

- (a) Derive Euler's equation of motion and hence Bernoulli's equations.
   [8]
  - (b) Compare impulse turbine with reaction turbines. [5]

- 4. (a) List out the major and minor losses with equations, taking place in pipe flow. [6]
  - (b) Derive an expression for force exerted by fluid jet on inclined stationary flat plate. [7]
- 5. (a) For a draft tube shown in Fig.1, prove that the pressure head at the outlet of the turbine is given by, [7]





(b) Explain in brief the Buckingham's theorem as a method of dimensional analysis.[6]

Or

6. (a) The pressure drop 'ΔP' in a pipe diameter 'd' and length 'l' depends on mass density 'ρ' and viscosity 'µ' of the flowing fluid, mean velocity of flow 'V' and average height 'K' of roughness projections on the pipe surface. Show that the pressure drop can be expressed in the form : [9]

$$\Delta \mathbf{P} = \rho \mathbf{V}^2 \quad \phi \left(\frac{l}{d}, \frac{\mu}{\rho V d}, \frac{\mathbf{K}}{d}\right)$$

- (b) Why is draft tube used in reaction turbine ? What are the different types of draft tubes used in practice ? [4]
- 7. (a) Prove that the minimum speed required for the centrifugal pump to start is given by. [6]

$$\mathbf{N} = \frac{120}{\pi} \left( \frac{\mathbf{V}_{w_2} \mathbf{D}_2}{\mathbf{D}_2^2 - \mathbf{D}_1^2} \right) n_{mano}$$

(b) Define Mechanical efficiency, Manometric efficiency and Overall efficiency for centrifugal pump. [6]

### Or

- 8. (a) Explain cavitation and its prevention in Centrifugal pump.[6]
  - (b) Explain the working of hydraulic ram with the help of sketch and explain its working characteristics with the help of graph.

Total No. of Questions-8]

[Total No. of Printed Pages-3

Seat	
No.	

# [5252]-123

# S.E. (Mechanical Sandwich) (Second Semester) EXAMINATION, 2017 METROLOGY AND QUALITY CONTROL

### (2012 PATTERN)

### Time : Two Hours

#### Maximum Marks : 50

- **N.B.** :- (i) Neat diagrams must be drawn wherever necessary.
  - (*ii*) All questions are compulsory, i.e.. (Solve Q. No. 1 or Q, No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6.
    Q. No. 7 or Q. No. 8).
  - (iii) Assume suitable data if necessary.
  - (iv) Use of calculator is allowed.
  - (v) Figures to the right side indicate full marks.
- (a) What is meant by standards ? Differentiate between line standard and end standard. [6]
  - (b) Explain with neat sketch sigma comparator. [6]

Or

- 2. (a) State Taylor's principle of gauge design. Draw progressive type plug and snap gauge. [6]
  - (b) Explain working of NPL Flatness Interferometer with neat sketch. [6]

P.T.O.

3.	<i>(a)</i>	Calculate the effective diameter for an external screw threa	d
		given the following data :	
		Pitch = $3.500 \text{ mm}$	
		Diameter of calibrated standard = $30.000 \text{ mm}$	
		Measurement over the standard = $15.3770 \text{ mm}$	
		Measurement over the screw thread = $14.3430$ mm	
		Diameter of the best wire = 2.000 mm. [6	3]
	( <i>b</i> )	Explain in brief the following : [6	3]
		(i) Cost of quality	
		(ii) Value of quality.	
		Or	
4.	<i>(a)</i>	Explain in detail Advance in Metrology. [6	3]
	( <i>b</i> )	Write a short note on Ishikawa diagram and Pareto analysis. [6	3]
<b>5</b> .	(a)	Explain in detail TPM and its pillars	7]
	( <i>b</i> )	Write a short note on TS 16949.	3]
		Or	
6.	<i>(a)</i>	Discuss the following quality management concept : [8	3]
		(i) Zero Defect	
		( <i>ii</i> ) Just in Time.	
	( <i>b</i> )	Explain FMECA. [8	5]
7	$(\alpha)$	Ton complex of parts were taken from a production line for	170
	(u)	100% inspection Fach sample containing 200 parts. The tat	יי 1
		100% inspection. Each sample containing 500 parts. The tota	11

limit.

### [5252]-123

 $\mathbf{2}$ 

number of defective was 350. Compute upper and lower control

[6]

(b) Differentiate between Single, Double and Multiple Sampling plan. [7]

- 8. (a) For a certain process following are the observations X Double Bar = 100.76,  $\sigma$  = 0.51, Technical Specification = 100 ± 2. Determine Cp and Cpk. [5]
  - (b) State and explain how to calculate the control limits for Variable chart and Attribute chart. [8]

Total No. of Questions-8]

Seat	
No.	

# [5252]-124

## S.E. (Mechanical SW) (Second Semester) EXAMINATION, 2017 MANUFACTURING ENGINEERING

#### (2012 **PATTERN**)

#### **Time : Two Hours**

Maximum Marks : 50

- **N.B.** :- (i) All the four questions should be solved in one answer-book and attach extra supplements if required.
  - (*ii*) Figures to the right indicate full marks.
  - (iii) Neat diagrams must be drawn wherever necessary.
  - *(iv)* Use of non-programmable electronic pocket calculator is allowed.
  - (v) Assume suitable data, if necessary.
  - (vi) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4,
    Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
- 1. (a) Explain projection welding with a neat sketch. [6]
  - (b) Why gating system is required in casting ? Explain with neat sketch. [6]

#### Or

- **2.** (a) Explain gas welding with neat sketch. [6]
  - (b) Compare Hot working and Cold working forming processes. [6]

- **3.** (a) What is Merchant's circle ? [6]
  - (b) Calculate the arrangement of gears for cutting a screw thread of 26 T.P.I. in a lathe with a leadscrew having 4 T.P.I., change wheels available are from 20 teeth to 120 teeth with a progression of 5.

- 4. (a) With a neat diagram explain any three types of milling cutters. [6]
  - (b) Explain USM with neat diagram. [6]
- 5. (a) Sketch and explain how Progressive die is different from combination die. [6]
  - (b) Find centre of pressure of the following blank as shown in fig. with thickness of blank 2 mm and material M.S. [7]



Explain any three press operations with neat sketch." 6. *(a)* [6] (*b*) Explain types of press used in sheet metal working. [7]7. *(a)* With neat sketch explain types of V-locators. [6) (*b*) Compare jigs and fixture. (7]Or 8. *(a)* Explain main elements of jigs and fixture. [6] (*b*) State various types of fixtures and explain turning fixture with neat sketch. [7]

3

Total No. of Questions-8]

Seat	
No.	

# [5252]-125

# S.E. (Mechanical Sandwich) (Second Semester) EXAMINATION, 2017 THERMAL ENGINEERING

### (2012 PATTERN)

#### **Time : Two Hours**

#### Maximum Marks : 50

- N.B. :- (i) Solve any four questions (Q. No.1 or Q. No.2, Q. No.3 or Q. No.4, Q. No.5 or Q. No.6, Q. No.7 or Q. No.8).
  - (*ii*) All the *four* questions should be solved in one answer-book and attach extra supplements if required.
  - (*iii*) Neat diagrams must be drawn wherever necessary.
  - (iv) Figures to the right side indicate full marks.
  - (v) Use of steam table, Mollier charts, scientific calculator is allowed.
  - (vi) Assume suitable data, if necessary.
- (a) Why are multistage compressors preferred over single stage ? Explain in detail with P-V diagram. [6]
  - (b) In a standard vapour compression refrigeration cycle, operating between an evaporator temperature of -10°C and a condenser temperature of 40°C, the enthalpy of the refrigerant, Freon-12, at the end of compression is 220 kJ/kg. Show the cycle diagram on T-s plane. Calculate :

- (i) The C.O.P. of the cycle.
- (ii) The refrigerating capacity and the compressor power assuming refrigerant flow rate of 1 kg/min. [3+3]You may use the extract of Freon-12 property table given below :

t(°C)	p(MPa)	$h_f(kJ/kg)$	$h_{g}(kJ/kg)$
-10	0.2191	26.85	183.1
40	0.9607	74.53	203.1
		Or	

- (a) In a three stage compressor, air is compressed from 98 kPa to 2000 kPa. Calculate for 1 m<sup>3</sup> of air per second, [6]
  - (i) Power under ideal condition for n = 1.3,
  - (ii) Isothermal power
  - (*iii*) Isothermal efficiency.
  - (b) What do you understand by primary and secondary refrigerants? Explain with examples. [6]
- 3. (a) Atmospheric conditions are; 20° and specific humidity of
   0.0095 kg/kg of dry air. Calculate the following : [6]
  - (i) Partial pressure of vapour
  - (*ii*) Relative humidity
  - (*iii*) Dew point temperature (Use psychrometric relations)
  - (b) Explain battery ignition system with a neat sketch. [6]

#### [5252]-125

 $\mathbf{2}$ 

- **4.** (*a*) Explain the following :
  - (*i*) Effective temperature
  - (*ii*) Application of air-conditioning.
  - (b) In a test of single-cylinder, four stroke diesel engine, the following data were recorded : [6] Indicated mean effective pressure = 755 kPa Cylinder diameter = 10 cm Piston stroke = 15 cm Engine speed = 480 rpm Brake wheel diameter = 62.5 cm Net load on the brake wheel = 170 N Calculate :
    - (i) Indicated power
    - (ii) Brake power
    - (iii) The mechanical efficiency of the engine.

5. (a) Explain stages of combustion in C.I. engine. [6]

(b) Describe with neat sketch catalytic converter system. [7]

#### Or

# **6.** (a) Explain *three* types of combustion chambers used in S.I. engines.

3

[6]

[6]

- (b) Write short notes on :
  - (*i*) Ignition delay and factors affecting delay period.
  - (*ii*) Emissions from S.I. and C.I. engines and their harmful effects. [3+4]

#### [5252]-125

P.T.O.

- 7. (a) Describe with neat sketches the working of a simple constant pressure open cycle gas turbine. [6]
  - (b) Derive optimum pressure ratio for maximum net work as function of the limiting temperature ratio and show that intermediate temperature must be equal to the geometric mean of temperature limits of the cycle ? [5+2]

- 8. (a) Explain the workings of a Ramjet engine with the help of a sketch. What are its applications. [6]
  - (b) A gas turbine unit has a pressure ratio of 6 : 1 and maximum cycle temperature of 610°C. The isentropic efficiencies of the compressor and turbine are 0.80 and 0.82 respectively. Calculate the power output in kilowatts of an electric generator geared to the turbine when the air enters the compressor at 15°C at the rate of 16 kg/s. Take  $C_p = 1.005$  J/kg.K and  $\gamma = 1.4$  for the compression process, and take  $C_p = 1.11$  kJ/kg.K and  $\gamma = 1.333$  for the expansion process. Show the schematic diagram of the plant and represent the processes on T-S diagram. [7]

Total No. of Questions—8]

Seat	
No.	

# [5252]-131

## S.E. (E&TC/Electronics) (First Semester) EXAMINATION, 2017 SIGNALS AND SYSTEMS

#### (2012 **PATTERN**)

Time : Two Hours

- Maximum Marks : 50
- N.B. :- (i) Attempt four questions, Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.
  - (*ii*) Figures to the right indicate full marks.
  - (iii) Assume suitable data, if necessary.
  - (iv) Neat diagrams should be drawn wherever necessary.
  - (v) Use of electronic non-programmable calculator is allowed.
- 1. (a) Find the time shifted signal : [4] y[n] = x[n + 4]

$$x[n] = \begin{cases} 1 & n = 1, 3 \\ -1 & n = -1, -2 \\ 0 & n = 0, 2 \end{cases}$$

- (b) Find whether the following signals are periodic or not. If periodic, calculate the fundamental period : [4]
  - (*i*)  $x[t] = \sin 200 \pi t + 2 \cos 100 \pi t$

$$(ii) \quad x[n] = \sin \frac{62n}{10}$$
 P.T.O.

(c) Determine whether the following system is Static/Dynamic, Linear/non-linear causal/non-causal and stable/unstable [4]

$$y(t) = x^2(t).$$
  
Or

2. (a) Determine and sketch, even and odd components of the following signals : [4]

(*i*) 
$$x[n] = e^{-(n/4)} u[n]$$

(*ii*) 
$$x(t) = 1, 0 \le t \le 4$$
.

(b) Determine whether the following signals are energy signals, power signals or neither : [4]

(i) 
$$x(t) = e^{-at} u(t), a > 0$$

$$(ii) \quad x(t) = t.u(t).$$

(c) Determine the stability and causality for the LTI system with the following impulse responses : [4]

(*i*) 
$$h(t) = e^{-t}u(t - 1)$$

- $(ii) \quad h[n] = \cos [n]u[n].$
- 3. (a) Find the quadrature Fourier series for the full wave rectified sine wave as shown in Fig. [6]



(b) Using properties of Laplace transform, find : [6] (i) x(3t)(ii) x(t - 2), if  $X(s) = \frac{2s}{s^2 + 2}$ .

- 4. (a) Calculate Laplace transform of  $x(t) = e^{-2t} u(t) e^{2t} u(-t)$  and plot ROC. [6]
  - (b) Find initial and final value of : [6]

(i) 
$$X(s) = \frac{0.8}{s(s^2 + 0.6s + 0.2)}$$
  
(ii)  $\frac{1}{s+1}$ .

5. (a) Find the following for the given signal x(t): [6]

- (*i*) Autocorrelation
- (*ii*) Energy from x(t) and Autocorrelation
- (*iii*) Energy spectral density  $x(t) = e^{-4t} . u(t)$ .
- (b) Define energy spectral density and prove relation between Autocorrelation and ESD. [4]
- (c) Plot the correlogram for the sequences x[n] and y[n] given below: x[n] = u[n]; y[n] = u[n - 4]. [3]

- 6. (a) State and describe properties of Autocorrelation function of CT energy signals. [6]
  - (b) Find the cross correlation by analytical method of the following signals : [7]

 $x_1[n] = \{4, 3, 2, 1\}, x_2[n] = \{3, 2, 1, -1\}.$ 

[5252]-131

P.T.O.

7. (a) Probability Density Function (PDF) of a random variable X is given by : [7]

$$f_{x}(\mathbf{X}) = \begin{cases} k(1 - \mathbf{X}^{2}) & 0 \le \mathbf{X} \le 1\\ 0 & \text{otherwise} \end{cases}$$

Then find (1) k (2) CDF (3)  $P(0 \le X \le 2)$ .

- (b) There are four white shirts and five black shirts inside a bag.
   What is the probability of drawing a white shirt from a bag ?
   [4]
- (c) State the significance of standard deviation. [2]

- 8. (a) State the properties of probability distribution function. [6]
  - (b) With example, explain the concept of Continuous Random Variable and Discrete Random Variable. What is the CDF and PDF ? Plot PDF of uniform distributed random variable over an interval (0 to  $2\pi$ ). [7]

Total No. of Questions-8]

Seat	
No.	

# [5252]-132

## S.E. (E&TC/Electronics) (First Semester) EXAMINATION, 2017 ELECTRONIC DEVICES AND CIRCUITS (2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

- - (*ii*) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (*iv*) Use of scientific calculator is allowed.
  - (v) Assume suitable data, if necessary.
- (a) What is operating point ? Explain its significance with d.c. load line. Also, state why voltage divider bias with emitter resistor is preferred over other biasing methods. [6]
  - (b) Calculate Av, Ri, Ro for the CE amplifier as shown in Fig. 1. Given :  $h_{re} = h_{oe} = 0$ ,  $h_{ie} = 1$  k $\Omega$ ,  $h_{fe} = 350$ . [7]



Fig. 1

- **2.** (a) Define various stability factors and explain its significance with necessary equations. [6]
  - (b) Explain the significance of hybrid parameters in BJT. [3]
  - (c) Compare CE, CB, CC on the basis of Ri, Ro and their applications. [4]
- 3. (a) For a cascaded two stage amplifier using identical transistors, find lower and higher cutoff frequencies and bandwidth. The *h*-parameters for the transistors are  $h_{ie} = 1.1 \text{ k}\Omega$ ,  $h_{fe} = 250$ ,  $h_{re} = h_{oe} = 0$ . The lower cutoff frequency of single stage is 100 Hz and higher cutoff frequency in 15 KHz. [6]
  - (b) Draw all the four topological block diagram for -ve feedback amplifiers. State application of each of the amplifier. [6]

#### Or

- 4. (a) The parameters of the transistors in the ckt shown in Fig. 2 are  $h_{fe} = 50$ ,  $h_{ie} = 1.1 \text{ k}\Omega$ ,  $h_{re} = h_{oe} = 0$ . Find : [6] (i) Value of C<sub>h</sub> for 3-dB frequency response of 20 Hz
  - (*ii*) Value of  $C_b$  necessary to ensure less than 10% till for 100 Hz square wave 1/p.



Fig. 2

(b) State Barkhousen criterion. Find frequency of oscillation for LC oscillator with  $L_1 = 1 \mu H$ ,  $L_2 = 3 \mu H$ ,  $C = 0.01 \mu F$ . Also identify the name of oscillator and state the application of the oscillator. [6]

(b) For class-B amplifier providing 20 V peak signal to 16 Ω load (speaker) and power supply of 30 V. Determine the 1/P power, O/P power and efficiency. [7]

#### Or

6. (a) A sinusoidal signal  $V_s = 1.95 \sin 400 t$  is applied to a power amplifier. The resulting current is

$$I_0 = 12 \sin 400 t + 1.2 \sin 800 t +$$

 $0.9 \sin 1200 t + 0.4 \sin 1600 t$ .

Calculate :

- (i) total harmonic distortion
- (*ii*) %age increase in power due to distortion. [7]
- (b) Draw a single power supply class AB complimentary push-pull amplifier and explain how cross-over distortion is eliminated in this amplifier with wave forms. [6]
- (a) Plot transfer and drain characteristics of n-channel E-MOSFET with necessary static and dynamic parameters. State equation for saturated current. [7]
  - (b) What is constant current source biasing ? Explain with circuit diagram in detail. [6]

#### [5252]-132

P.T.O.

- 8. (a) Explain the effect of substrate potential in MOS based on integrated circuits. Also, explain the effect of channel length modulation. [6]
  - (b) Find  $I_D$ ,  $V_{DS}$ ,  $V_{GS}$  for the circuit shown in Fig. 3. Given  $V_{Th} = 0.8 \text{ V}, \text{ K} = 1 \text{ mA/V}^2, \lambda = 0.$  [7]



Fig. 3

Total No. of Questions-8]

**Time : Two Hours** 

Seat	
No.	

# [5252]-133

# S.E. (E&TC/Electronics) (I Semester) EXAMINATION, 2017 NETWORK THEORY

### (2012 PATTERN)

Maximum Marks : 50

- N.B. :- (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.
  - (*ii*) Figures to the right indicate full marks.
  - (iii) Neat diagrams must be drawn wherever necessary.
  - (iv) Assume suitable data if necessary.
  - (v) Use of non-programmable calculator is permitted.
- 1. (a) Determine Vx in the circuit of Fig. 1, using Kirchhoff's laws.[6]



(b) Draw the dual of the network shown in Fig. 2.



P.T.O.

[6]

2. (a) Determine the Thevenin equivalent of the network shown in Fig 3.[6]



(b) For the oriented graph shown in Fig. 4. Determine the Tieset matrix and *f*-cutset matrix. [6]



**3.** (a) The switch is opened at t = 0 for the network shown in Fig. 5, Find voltage labeled V at t = 200 ms and also plot V(t).[6]



(b) A series RLC circuit consists of  $R = 100 \Omega$ , L = 0.02 H and  $C = 0.02 \mu f$ . Calculate frequency of resonance. Calculate voltage across L and C at frequency of resonance. Also find maximum current in the circuit. [6]

#### Or

4. (a) In the circuit shown in Fig. 6, the switch is changed from position 1 to 2 at t = 0. Determine initial conditions of  $i, di/dt, d^{2}i/dt^{2}$  at  $t = 0^{+}$ . [6]





- (b) Explain the variation of voltage across R, L and C on graph with frequency at resonance. Also write the equation of frequencies at which voltage across C and L are miximum. [6]
- 5. (a) If the measurements made on a box enclosing a two-port network are  $Z_{loc} = 40 \angle 0^{\circ} \Omega$ ,  $Z_{lsc} = 22.3 \angle 29.8^{\circ} \Omega$ . Find the values of characteristic impedance and propagation constant along with attenuation constant and phase constant, if the network is symmetrical. [7]
  - (b) Design a constant k high pass  $\pi$  section filter to have a design impedance of 600  $\Omega$ . The filter must have attenuation of 8.11 dB at 4.5 KHz. Also calculate phase angle at f = 5.5 kHz.[6]

- 6. (a) Design m-derived T section LPF having cutoff frequency of 5 KHz and impedance of 600 Ω. The frequency of infinite attenuation is 1.25 times the cutoff frequency. [7]
  - (b) Define attenuation in Neper and Decibel. Derive the relationship between Neper and Decibel. [6]
- 7. (a) Find Z parameters for the network shown in Fig. 7 [6]





(b) Find the driving point admittance Y(s) for the network shown in Fig.8. Also plot pole zero diagram. [7]



Fig. 8

- 8. (a) Define symmetrical network. Derive expression for condition of symmetry for T parameter. [6]
  - (b) Determine hybrid parameters for the network shown in Fig. 9. [7]



Fig. 9

Total No. of Questions—8]

[Total No. of Printed Pages-2]

Seat	
No.	

## [5252]-134

# SE (E&TC and Electronics) (I Sem.) EXAMINATION, 2017 DATA STRUCTURES AND ALGORITHMS

### (2012 PATTERN)

Time : Two Hours Maximum Marks : 50 1. How can a polynomial be stored using an array ? Explain (a)[6] with example. (b)Differentiate between static memory and dynamic memory allocation. [6] Or 2. Define pointers and write swap function to swap two using (a)pointers. [6] Explain with suitable examples, how to pass structure variable (b)to function. [6] 3. Differentiate between SLL and DLL. (*a*) [6] (b)What is priority queue ? Explain any one in detail. [6] Or4. Write a function in 'C' to delete a node in SLL. (a)[6] Write a short note on circular queue. Compare it with linear (b)[6] queue. 5. What is AVL tree ? Define balance factor. Explain RR rotation (a)with an example. [6] (b)Explain threaded binary tree with example. [6]

- 6. Write a function in 'C' to search a number in BST. [6]
  - (b) Explain traversal of binary tree ? Explain three popular methods of binary tree traversal. [5]
  - (c) What is AVL tree ? Write structure of AVL tree. [2]
- (a) Write C function to implement DFS traversal of a graph implemented using adjacency matrix. [6]
  - (b) Define term Graph. With the help of suitable example give adjacency matrix representation and adjacency list representation of a graph.
     [7]

#### Or

- 8. (a) What is indegree and outdegree of a vertex in a graph ?
  Write C function to find indegree and outdegree of vertex in a graph using adjacency matrix. [7]
  - (b) What is spanning tree ? Find minimal spanning of the following graph using Prim's algorithm : [6]



#### [5252]-134

 $\mathbf{2}$ 

Total No. of Questions-8]

Seat	
No.	

# [5252]-135

# S.E. (Electronics & Telecommunication) (Semester-I) EXAMINATION, 2017 DEGITAL ELECTRONICS

### (2012 PATTERN)

### Time : Two Hours

- **N.B.** :— (i) Figures to the right indicate full marks.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Assume suitable data, if necessary.

1.	(a)	Define	and	explain	:
				-	

- (i) Fan out
- (ii) Noise Margin
- (iii) Propagation Delay
- (*iv*) Power Dissipation
- (b) Write a short note on look ahead carry generator. [4]

Or

- 2. (a) Explain with neat diagram interfacing of TTL gate driving CMOS gate and vice versa. [6]
  - (b) Design an even parity generator circuit for 4-bit input using multiplexer.

P.T.O.

### Maximum Marks : 50

[8]

- **3.** (a) Explain the difference between combinational and sequential circuits. [4]
  - (b) Design a sequence defector to detect the following sequence using D flip-flop -- 110 -- [8]

- **4.** (a) Explain : [6]
  - (i) State Table
  - (ii) State Diagram
  - (*iii*) State Assignment.
  - (b) Convert JK FF to T FF. [6]
- 5. (a) Explain the difference between CPLD and FPGA. [6]
  - (b) Implement the following functions using PLA : [7]  $F_1(A, B, C) = \Sigma m(2, 3, 7)$   $F_2(A, B, C) = \Sigma m(3, 4, 6)$ 
    - Or
- 6. (a) Design a BCD to excess 3 code converter and implement it using PAL [8]
  - (b) Explain difference between PLA and PAL. [5]
- 7. (a) Explain the defference between concurrent statement and sequential statement in VHDL. [6]

(b) Write the VHDL code for 4-bit ripple up-counter. [7] [5252]-135 2

- 8. (a) Explain the following statements used in VHDL with suitable examples : [8]
  - (*i*) Entity
  - (ii) Architecture
  - (iii) Process
  - (*iv*) IF
  - (b) Write the VHDL code for D flip-flop using asynchronous reset input. [5]
[Total No. of Printed Pages-3]

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No.	

## [5252]-136

# S.E. (Electronics/Electronics & Telecommunication) (Second Semester) EXAMINATION, 2017 INTEGRATED CIRCUITS

### (2012 **PATTERN**)

#### **Time : Two Hours**

Maximum Marks : 50

- N.B. := (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6and Q. 7 or Q. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right indicate full marks.
  - (iv) Use of electronic pocket calculator is allowed.
  - (v) Assume suitable data, if necessary.
- 1. (a) Derive the expression for  $A_d$ ,  $R_i$  and  $R_o$  for dual input balanced output difference amplifier using *r*-parameters. [6]
  - (b) Define and explain the following terms with respect to Op-Amp: PSRR, CMRR, Gain bandwidth product. [6]

### Or

- 2. (a) What is the need of frequency compensation ? Explain pole zero method of external frequency compensation. [6]
  - (b) With neat diagram explain the necessity and working of current mirror circuit. [6]

- (a) What are problems associated with the ideal integrator ? Draw neat circuit diagram of practical integrator. Explain its operation with its frequency response.
  - (b) Draw and explain difference amplifier using Op-amp. Derive the expression for its output voltage. [6]

- (a) Explain the necessity of Precision rectifier and explain the operation of Full wave Precision rectifier with neat circuit diagram.
  - (b) Draw and explain Sample and Hold circuit using Op-amp.Explain the necessity of Sample and Hold circuit. [6]
- (a) With the help of neat diagram explain the operation of R-2R ladder type of DAC. [7]
  - (b) Draw neat diagram and V to I convertor with grounded load and explain its operation. [6]

#### Or

- 6. (a) Calculate output voltage of 6-bit DAC for digital input 100000,
  111111 and 111100 with reference voltage of 5V. [6]
  - (b) With the help of neat diagram explain the operation of Dual Slope ADC. [7]

 $\mathbf{2}$ 

- 7. (a) Explain operation of PLL with the help of neat block diagram.Define the terms Lock range and Capture range. [7]
  - (b) Draw neat diagram and explain three-terminal adjustable voltage regulator with expression for output voltage. [6]

- 8. (a) Draw and explain circuit of FM demodulator using PLL. [7]
  - (b) Explain low drop out voltage regulator. [6]

Seat	
No.	

## [5252]-137

# S.E. (Electronics/E&TC) (Second Semester) EXAMINATION, 2017 CONTROL SYSTEM

### (2012 PATTERN)

#### **Time : Two Hours**

#### Maximum Marks : 50

**N.B.** :- (i) Neat diagrams must be drawn wherever necessary.

- (*ii*) Figures to the right indicate full marks.
- (iii) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- (iv) Assume suitable data, if necessary.
- (a) Derive the force to voltage and force to current analogy between mechanical and electrical systems. [6]
  - (b) For unity feedback system with open loop transfer function  $G(s) = \frac{36}{s(s+6)}$  determine rise time, peak time, peak overshoot and setting time with 2% criterion. [6]

2. (a) Determine C(s)/R(s) for the block diagram shown in Figure No. 1 using block diagram reduction. [6]



## Fig. 1

- (b) A second order system has peak time of 2 sec and peak overshoot of 10%. Find its damping factor, undamped natural frequency, setting time with 2% criterion and closed loop transfer function if its gain at steady state is unity. [6]
- **3.** (a) Investigate the stability of system with characteristic equation :

 $\mathbf{2}$ 

$$\mathbf{Q}(s) = s^4 + s^3 + 2s^2 + 2s + 1 = 0$$
 [4]

(b) Sketch Nyquist plot and investigate the stability of a system with open loop transfer function :

$$G(s)H(s) = \frac{50}{(s+1)(s+2)(s+5)}.$$
[8]

4. (a) Explain how stability analysis is done using Bode Plot. [4]

(b) For unity feedback system with open loop transfer function:

$$G(s) = \frac{K}{s(s+1)(s+5)}, \text{ sketch root locus.}$$
[8]

5. (a) Determine state transition matrix of : [7]

 $\mathbf{A} = \begin{bmatrix} 0 & 1 \\ -5 & -6 \end{bmatrix}.$ 

- (b) Define the following : [6]
  - (i) State
  - (*ii*) State variables
  - (iii) State vector,
  - (iv) State space,
  - (v) State controllability,
  - (vi) State observability.
    - Or
- 6. (a) Investigate state controllability and state observability if

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & -3 & -4 \end{bmatrix}, \quad B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & 2 & 1 \end{bmatrix}.$$
 [6]

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(b) Determine the state model of the system shown in Figure No. 2. [7]





- 7. (a) List different control actions and control modes of PID controller and explain all control actions. [7]
  - (b) Explain the operation of digital control system with the help of block diagram. [6]

Or

8. (a) Determine Pulse transfer function and impulse response of the system shown in Figure No. 3 [7]



- Fig. 3
- (b) Explain PLC with the help of its block diagram. [6]

Seat	
No.	

## [5252]-138

## S.E. (E&TC/Elect.) (Second Semester) EXAMINATION, 2017 ANALOG COMMUNICATION

#### (2012 **PATTERN**)

#### **Time : Two Hours**

### Maximum Marks : 50

- **N.B.** :- (i) Neat diagrams must be drawn wherever necessary.
  - (*ii*) Figures to the right indicate full marks.
  - (iii) Assume suitable data, if necessary.
  - (iv) Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No.
    4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
- (a) Explain the need of modulation and the advantages of modulation. [6]
  - (b) For a standard AM transmitter has un-modulated power output of 100 W, when sinusoidally modulated signal the power increases to 132 W, the transmitter feeds a resistance load of 100  $\Omega$ .

Calculate :

- (*i*) Modulation index;
- (ii) Sketch the spectrum of AM signal with carrier 1 MHz and modulating frequency of 10 kHz.
- (*iii*) with trapezoidal method with practical modulation index calculate  $V_{max}$  and  $V_{min}$ . [6]

- (a) Describe the square law modulator using mathematical expression.
   [6]
  - (b) A carrier wave of frequency of a 1 MHz is frequency modulated by a size wave of amplitude of 10 V and 15 kHz. The frequency sensitivity of modulator is 3 kHz/V.
    - (i) Determine the approximate bandwidth of FM using Carlson's rule.
    - (*ii*) Repeat part (*i*) assuming amplitude of modulating wave is doubled.
    - (*iii*) Repeat part (*i*) assuming frequency of modulating wave doubled.
- 3. (a) A radio receiver with 10 kHz bandwidth has noise figure of 30 dB. Determine the signal power at the output of the receiver to achieve input signal of noise ratio of 30 dB. [6]
  - (b) Draw and explain the functional block diagram of FM superheterodyne receiver. [6]

- 4. (a) Draw the simple diode detector and explain the distortions that occur in it. [6]
  - (b) Write a note on types of Noise. [6]
- 5. (a) Explain the performance of FM in the presense of Noise. [7]
  (b) Derive performance of Baseband system in the presense of noise. [6]

#### Or

- 6. (a) Write a note on Angle thresholding. [6]
  - (b) Derive performance of AM in presence of noise considering receiver as envelop detector. [7]

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- 7. (a) Define time limited and Band limited signals, also justify that time limited signals. Cannot be band limited. [6]
  - (b) Draw and explain functional block diagram of PCM encoder and decoder. [7]

- 8. (a) State sampling theorem ? With spectrum explain natural and flat top sampling. [7]
  - (b) Draw and explain with wave forms generation and Re-generation of PPM. [6]

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No.	

## [5252]-139

## S.E. (Elect/E&TC) (Second Semester) EXAMINATION, 2017 COMPUTER ORGANIZATION

#### (2012 Pattern)

## Time : Two Hours

## Maximum Marks : 50

- **N.B.** :- (i) Neat diagrams must be drawn wherever necessary.
  - (*ii*) Figures to the right indicate full marks.
  - (iii) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (iv) Assume suitable data, if necessary.
- (a) Draw the block diagram of basic structure of computer and explain function of each block. [6]
  - (b) Give the IEEE standard for floating point numbers for :
    - (*i*) Single precision number
    - (*ii*) Double precision number [6]

#### Or

- **2.** (a) Draw and explain single bus organization. [6]
  - (b) Multiply (7) and (3) using Booths algorithm. Register size 5 bits. [6]
- **3.** (*a*) Compare RISC and CISC processor. [6]
  - (b) Write a short note on PCI BUS. [6]

4.	(a)	Write control sequence for instruction MOVE (R1), (R2) using	
		single bus organization. [6]	
	( <i>b</i> )	What is BUS arbitration ? Explain Daisy chain and polling	
		method. [6]	
5.	<i>(a)</i>	Explain cache memory. Why is it used ? [6]	
	( <i>b</i> )	Explain the connection of memory to processor. [7]	
		Or	
<i>6</i> .	<i>(a)</i>	Explain the memory hierarchy of computer system. [6]	
	( <i>b</i> )	Explain the concept of virtual memory ? How virtual memory	
		addresses is translated to physical memory address ? [7]	
7.	<i>(a)</i>	List out addressing modes of 8086. [6]	
	( <i>b</i> )	Explain interrupt structure of 8086. [7]	
		Or	
8.	<i>(a)</i>	Explain the following addressing modes of 8086 with suitable	
		example : [6]	
		(i) Direct addressing	
		(ii) Register addressing	
		(iii) Immediate addressing	
	(b)	Draw flag structure of 8086 and explain operation of each	

(b) Draw flag structure of 8086 and explain operation of each flag. [7]

 $\mathbf{2}$ 

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## [5252]-140

### S.E. (Electronics/E&TC) (Second Semester)

#### **EXAMINATION, 2017**

#### **ENGINEERING MATHEMATICS-III**

#### (2012 PATTERN)

### Time : Two Hours

N.B. := (i) Attempt Q. 1 or 2, Q. 3 or 4, Q. 5 or 6, Q. 7 or 8.

- (*ii*) Neat diagram must be drawn wherever necessary.
- (*iii*) Figures to the right indicate full marks.
- (*iv*) Use of non-programmable pocket calculator (electronic is allowed).
- (v) Assume suitable data, if necessary.
- 1. (a) Solve any two: [8]

(i)  $(D^2 + 2D + 1) y = 2\cos x + 3x + 2$ 

(*ii*)  $\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$  (by method of variation of parameter)

(*iii*) 
$$x^2 \frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} - 4y = x^2 + 2 \log x$$
.

(b) Find Fourier cosine transform of  $f(x) = \begin{cases} x, & 0 \le x \le a \\ 0, & x > a \end{cases}$  [4] P.T.O.

#### Maximum Marks : 50

2. (a) An electric circuit consists of an inductance 0.1 henry, a resistance (R) of 20  $\Omega$  and a condenser of capacitance (C) of 25 microfarads. If the differential equation of electric circuit is  $L \frac{d^2q}{dt^2} + R \frac{dq}{dt} + \frac{q}{C} = 0$ , then find the charge 'q' and current 'i' at any time t, given that at t = 0, q = 0.05 coulombs.  $i = \frac{dq}{dt} = 0$  when t = 0. [4]

(b) Solve (any 
$$one$$
): [4]

(i) Find z-transfrom of  $f(k) = 2^k \cos (3k + 2)$ .

(*ii*) Find inverse z-transform of 
$$\frac{1}{\left(z-\frac{1}{2}\right)\left(z-\frac{1}{3}\right)}$$
 for  $\frac{1}{3} < |z| < \frac{1}{2}$ .

[4]

(c) Solve :  

$$f(k + 1) + \frac{1}{2}f(k) = \left(\frac{1}{2}\right)^k, \quad k \ge 0, f(0) = 0.$$

3. (a) Solve the equation 
$$\frac{dy}{dx} = \sqrt{x+y}$$
 using fourth order Runge-Kutta method given  $y(0) = 1$  to find y at  $x = 0.2$  taking  $h = 0.2$ .  
[4]

- (b) Find Lagrange's interpolating polynomial passing through set of points :

Hence find y at x = 0.5 and  $\frac{dy}{dx}$  at x = 2. [4]

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(c) Find the directional derivative of  $\phi = 4xz^3 - 3x^2y^2z$  at (2, -1, 2) in the direction of  $2\overline{i} - 3\overline{j} + 6\overline{k}$ . [4]

#### Or

4. 
$$(a)$$
 Show that  $(any one)$  :

(i) For scalar functions  $\phi \& \psi$ , show that :

$$\nabla \cdot (\phi \nabla \psi - \psi \nabla \phi) = \phi \nabla^2 \psi - \psi \nabla^2 \phi$$

$$(ii) \quad \nabla \cdot \left( r \nabla \frac{1}{r^3} \right) = \frac{3}{r^4}$$

- (b) Show that the vector field  $\overline{F} = (y^2 \cos x + z^2)\overline{i} + 2y \sin x\overline{j} + 2xz \overline{k}$  is irrotational. Find scalar  $\phi$  such that  $\overline{F} = \nabla \phi$ . [4]
- (c) Evaluate  $\int_{0}^{\pi/2} \frac{\sin x}{x} dx$  by using Simpson's  $\left(\frac{1}{3}\right)^{rd}$  rule by dividing the interval into four parts. Considering the values upto four decimals. [4]
- 5. (a) Evaluate  $\int_{c} \overline{F} \cdot d\overline{r}$  for  $\overline{F} = (5xy 6x^2)\overline{i} + (2y 4x)\overline{j}$  along the curve  $c : y = x^3$  in XOY plane from (1, 1) to (2, 8). [4]
  - (b) Use divergence theorem to evaluate :

$$\iint_{s} (y^{2}z^{2}\overline{i} + z^{2}x^{2}\overline{j} + x^{2}y^{2}\overline{k}). d\overline{S}$$

where S is the upper part of the sphere  $x^2 + y^2 + z^2 = 9$ above XOY plane. [5]

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P.T.O.

[4]

(c) Using Green's theorem, show that the area bounded by a simple closed curve C is given by :

$$\frac{1}{2}\int_{c}(x\,dy-y\,dx)$$

Hence find area of the ellipse

$$x = a \cos\theta, \ y = b\sin\theta.$$
 [4]  
Or

- 6. (a) Find the work done in moving a particle from A(1,0,1) to B(2,1,2) along the straight line AB in the force field  $\overline{F} = x^2 \overline{i} + (x - y)\overline{j} + (y + z)\overline{k}$ . [4]
  - (b) Evaluate :

$$\iint_{s} (\nabla \times \overline{\mathbf{F}}). \ d\overline{\mathbf{S}}$$

for the vector field  $F = 4y\overline{i} - 4x\overline{j} + 3\overline{k}$  where S is a disc of radius 1 lying on the plane z = 1. [5]

(c) Prove that :

$$\iint_{S} (\phi \nabla \psi - \psi \nabla \phi). \ d\overline{\mathbf{S}} = \iiint_{\mathbf{V}} (\phi \nabla^{2} \psi - \psi \nabla^{2} \phi) \ d\mathbf{V}$$

where S is any closed surface enclosing volume V. [4] (a) If f(z) = u + iv is an analytic function with  $u = \cosh x$  $\cos y$ , express f(z) in terms of z. [4]

(b) Evaluate :

$$\oint_c \frac{2z^2+z+5}{\left(z-\frac{3}{2}\right)^2} dz$$

where C is 
$$\frac{x^2}{4} + \frac{y^2}{9} = 1$$
. [4]

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7.

(c) Find the bilinear transformation which maps the points 0, -i, -1 from z-plane into the points i, 1, 0 of the w-plane. [5]

8. (a) If  $f(z) = u + iv = f(r e^{i\theta})$  is analytic, show that u satisfies the Laplace equation  $\frac{\partial^2 u}{\partial r^2} + \frac{1}{r} \frac{\partial u}{\partial r} + \frac{1}{r^2} \frac{\partial^2 u}{\partial \theta^2} = 0.$  [4]

(b) Evaluate 
$$\oint_{c} \frac{e^{2z}}{z(z-1)^2} dz$$
 over  $c$  :  $|z| = 3.$  [4]

(c) Show that the bilinear transformation  $w = \frac{2z+3}{z-4}$  maps the circle  $x^2 + y^2 - 4x = 0$  into the line 4u + 3 = 0. [5]

Seat	
No.	

## [5252]-141

Maximum Marks : 50

## S.E. (Electrical/ Instrumentation) (First Semester) EXAMINATION, 2017

#### **ENGINEERING MATHEMATICS-III**

#### (2012 **PATTERN**)

### **Time : Two Hours**

$$N.B. := (i)$$
 Attempt Q. 1 or 2, Q. 3 or 4, Q. 5 or 6, Q. 7 or 8.

- (*ii*) Neat diagrams must be drawn wherever necessary.
- (*iii*) Figures to the right indicate full marks.
- *(iv)* Use of non-programmable electronic pocket calculator is allowed.
- (v) Assume suitable data, if necessary.

$$1. (a) Solve any two : [8]$$

(i) 
$$\frac{d^2 y}{dx^2} + y = \sin 3x \cos 2x$$
  
(ii)  $(2x+3)^2 \frac{d^2 y}{dx^2} + (2x+3) \frac{dy}{dx} - 2y = 24x^2$ 

(*iii*) 
$$\frac{d^2y}{dx^2} + 9y = \frac{1}{1 + \sin 3x}$$
 (Use method of variation of parameters)

(b) Solve the differential equation by using Laplace transfrom method :  $\frac{d^2y}{dt^2} + 8\frac{dy}{dt} = 8\cos t$  given  $y(\pi) = -1$ , y'(0) = -1. [4] P.T.O.

- 2. (a) An inductor of 0.5 henry is connected in series with resistor of 6 ohms, a capacitor of 0.02 farad. A generator having alternative voltage of 24 sin10t. Find q at any time t if q = 0, I = 0 at t = 0.
  - (b) Solve any one of the following :
    - (i) Find the Laplace transform of  $f(t) = \frac{1 e^{-bt}}{t}$
    - (ii) Find the inverse Laplace transform of

$$F(S) = \frac{1}{S} \log \left( 1 + \frac{1}{S^2} \right)$$
 [4]

(c) Using unit step function find the Laplace transform of the function f(t) = K(n - 1) for (n - 1) T < t < nT, n = 1, 2, 3.... where T is period. [4]</li>

3. (a) Represent the function in the Fourier integral form for  $f(x) = e^{-|x|}; -\infty < x < \infty$  [4]

(b) Find 
$$z^{-1}\left\{\frac{z^2}{z^2+1}\right\}$$
, by using inversion integral method. [4]

(c) Find the directional derivative of  $\phi = e^{2x} \cos yz$  at (0,0,0) in the direction of tangent to the curve  $x = a \sin t$ ,  $y = a \cos t$ , z = at at  $t = \pi/4$ . [4]

Or

4. (a) Prove the following (any one) : [4]

(i)  $\nabla^4 (r^2 \log r) = \frac{6}{r^2}$ (ii)  $\nabla \cdot \left( r \nabla \frac{1}{r^5} \right) = \frac{15}{r^6}$ .

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[4]

- (b) Shor that  $\vec{F} = \frac{1}{r} [r^2 \vec{a} + (\vec{a}.\vec{r})\vec{r}]$  is irrotational. Hence find scalar potential function  $\phi$ . [4]
- (c) Solve the difference equation : [4]

$$y_{k} - \frac{5}{6}y_{k-1} + \frac{1}{6}y_{k-2} = \left(\frac{1}{2}\right)^{k}; k \ge 0$$

- 5. (a) Using Green's theorem, evaluate  $\int_c [\cos y\overline{i} + x(1 \sin y)\overline{j}] d\overline{r}$  where c is the closed curve  $x^2 + y^2 = 1$ , z = 0. [4]
  - (b) Evaluate  $\iint_{S} (\nabla \times \overline{F}) \cdot \hat{n} \, ds$  for  $\overline{F} = x^{2}\overline{i} + y^{2}z\overline{j} + xy\overline{k}$  for the plane surface S bounded by x = 0, y = 0, x = 2, y = 2, z = 0. [5]
  - (c) Evaluate :  $\iint_{s} [3x \, dy \, dz 2y \, dz \, dx + 2z \, dx \, dy]$  over the surface of sphere of radius *a*. [4]

- 6. (a) Find the work done by  $\overline{F} = x^2 \overline{i} + yz\overline{j} + z\overline{k}$  in moving a particle along the straight line segment from (1, 2, 2) to (3, 4, 4). [4]
  - (b) Evaluate  $\iint_{S} \overline{F} \cdot \hat{n} \, dS$  where  $\overline{F} = x^3 \overline{i} + y^3 \overline{j} + z^3 \overline{k}$  and S is the surface of the sphere  $x^2 + y^2 + z^2 = a^2$  [5]
  - (c) Evaluate  $\iint_{S} (\nabla \times \overline{F}) \cdot d\overline{S}$  for  $\overline{F} = y\overline{i} + z\overline{j} + x\overline{k}$ , where S is the surface of paraboloid  $z = 1 x^2 y^2$ ,  $z \ge 0$ . [4]

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7. (a) If 
$$f(z)$$
 is analytic function, then prove that
$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |f(z)|^2 = 4 |f'(z)|^2.$$
[5]

(b) Find the bilinear transformation, which maps the points 1,  $i_{,-1}$  from Z-plane onto the points i, 0, -i of the w-plane. [4]

(c) Evaluate 
$$\oint_c \frac{e^{2z}}{(z+1)^4} dz$$
 where c is the circle  $|z| = 3$ . [4]

## Or

8. (a) If 
$$u = x^4 - 6x^2y^2 + y^4$$
, find its harmonic conjugate  $v$ , find  
 $f(z) = u + iv$  in terms of  $z$ . [5]

(b) Find the map of straight line y = x under the transformation  $w = \frac{z-1}{z+1}$ . [4]

(c) Evaluate 
$$\oint_{c} \frac{e^{2z}}{(z-1)(z-2)} dz$$
 where c is the circle  $|z| = 3$ .  
[4]

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## [5252]-143

S.E. (Electrical) (I Semester) EXAMINATION, 2017

### MATERIAL SCIENCE

### (2012 COURSE)

Time : Two Hours

Maximum Marks : 50

- N.B. :- Physical Constants :
  - (1) Angstrom Unit (AU) =  $1 \times 10^{-10}$  metres
  - (2) Boltzmann's constant (k) =  $1.380 \times 10^{-23}$  joule degree-1
  - (3) Charge on Electron (e) =  $1.601 \times 10^{-19}$  coulomb
  - (4) Mass of Electron (m) =  $9.107 \times 10^{-31} \text{ kg}$
  - (5) Electron volt (eV) =  $1.602 \times 10^{-19}$  joules
  - (6) Mass of Proton (m<sub>p</sub>) = 1.627 ×  $10^{-27}$  kg
  - (7) Velocity of light (c) =  $2.998 \times 10^8$  m/sec
  - (8) Dielectric Constant of free space ( $\epsilon_0$ ) = 8.854 × 10<sup>-12</sup> F/m
  - (9) Permeability of free space  $(\mu_0) = 4\pi \times 10^{-7}$  H/m
  - (10) Debye unit =  $3.33 \times 10^{-30}$  coulomb.metre
- **1.** (a) Explain the terms :
  - (*i*) Electric Susceptibility
  - (*ii*) Polarizability [6]
  - (b) State the properties and applications of :
    - (*i*) Ceramics
    - $(ii) \quad SF_6 \tag{6}$

- 2. (a) The no. of atoms in a volume of one cubic metre of hydrogen gas is  $8.4 \times 10^{26}$ . Radius of hydrogen atom is 0.53 AU. Calculate the polarizability and relative permittivity of hydrogen gas.[6]
  - (b) Explain the insulating materials used for :
    - (*i*) Power Transformers
    - (*ii*) Switchgears

- [6]
- **3.** (a) Write a note on classification of magnetic materials. [7]
  - (b) The resistivity of pure copper is 1.56 μΩcm and alloy of copper containing 1 atomic % Ni has resistivity 2.81 μΩcm. Alloy of copper containing 3 atomic % Ag has resistivity 1.98 μΩcm. What is the resistivity of Cu alloy for 2 atomic % Ni and 2 atomic % Ag ?

- 4. (a) If magnetic field of  $1.25 \times 10^5$  A/m applied to a magnetic material, the resultant flux density is 250 mWb/ $m^2$ . Calculate its permeability, susceptibility and magnetization. [7]
  - (b) Write a short note on Superconductivity. [6]
- 5. Write short notes on the following : [12]
  - (a) Carbon Nano-wire
  - $(b) C_{60}$

#### Or

6. Write short notes on following : [12]

 $\mathbf{2}$ 

- (a) Carbon nano-tubes (CNT)
- (b) Single Electron Transistor (SET)

#### [5252]-143

- (a) With neat sketch, explain the method to determine breakdown voltage of transformer oil. [7]
  - (b) Describe the method to determine the breakdown strength of solid dielectric in the laboratory as per IS. [6]

- 8. (a) Describe the method of measurement of tan δ of a dielectric by Schering Bridge as per IS code of practice. [7]
  - (b) With neat sketch, explain detail procedure for measurement of dielectric strength of air as per IS code of practice.[6]

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No.	

## [5252]-144

## S.E. (Electrical) (I Sem.) EXAMINATION, 2017 ANALOG & DIGITAL ELECTRONICS (2012 PATTERN)

### Time : Two Hours

### Maximum Marks : 50

- N.B. :- (i) Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right side indicate full marks.
  - (iv) Assume Suitable data, if necessary.
  - (v) Use of nonprogrammable calculator is permitted.
- 1. (a) Draw and explain the working of Universal shift register.[6]
  - (b) Explain the operation of JK flip flop with truth table. What do you mean by race round condition in JK flip flop ? [6]

Or

- 2. (a) Draw and explain 3 bit asynchronous up counter using flip flops. Write the timing sequence. [6]
  - (b) Convert the number into its equivalent number with appropriate step : [6]
    - (*i*)  $(5A9.B4)_{16} = ()_2$
    - $(ii) \quad (630.4)_8 = ( )_{10}$
- **3.** (a) Explain the working of IC 555 as Monostable Multivibrator. [6]
  - (b) Explain the working of OP-AMP as a Schmitt trigger. What is hysteresis in it ? [7]

- 4. (a) Explain operation of full wave precision rectifier. [6]
  - (b) Draw neat diagram and explain operation of OP-AMP as sine wave generator with output waveforms. [7]
- 5. (a) Describe operation of transformer coupled two stage BJT amplifier. [7]
  - (b) With a neat diagram explain the working of Differential amplifier.[6]

- **6.** (a) Write a short note on Push Pull amplifier with waveforms.[7]
  - (b) Draw and explain JFET output characteristic. [6]
- (a) Explain the working of single phase full wave bridge rectifier with R load.
  - (b) Explain with neat circuit diagram operation of three phase full wave bridge rectifir with RL load.[6]

- 8. (a) Compare single phase half wave rectifier and full wave rectifier.[6]
  - (b) A single phase full bridge diode rectifier is supplied from 220 V, 50 Hz source. The load consists of  $R = 5 \Omega$  and a large inductance so as to keep load current constant. Determine :
    - (1) Average values of output voltage and current.
    - (2) Average and rms value of diode current. [6]

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## [5252]-145

## S.E (Electrical) (I Sem.) EXAMINATION, 2017 ELECTRICAL MEASUREMENTS & INSTRUMENTATION (2012 PATTERN)

Time : Two Hours

### Maximum Marks : 50

- **N.B.** :- (i) Neat diagrams must be drawn wherever necessary.
  - (*ii*) Figures to the right indicate full marks.
  - (*iii*) Use of logarithmic table, slide rule, Mollier chart, electronic pocket calculator and steam table is allowed.
  - (*iv*) Assume suitable data if necessary.
- (a) What are the different methods used to produce controlling torque in analog indicating instruments ? List their advantages and disadventages. [6]
  - (b) Give classification of resistances. What are the different methods of measurement for each category ? [6]

- 2. (a) What are the advantages of CT/PT over shunt and multipliers for range extension of MI instruments ? [6]
  - (b) What are the different detectors used in a.c. bridges ? Elaborate each type in brief. Derive the general equation for bridge balance.
- 3. (a) When two wattmeter method is used for measurement of power in a three phase balanced circuit, comment upon the readings as the two wattmeter under the following conditions : [6]
  - (*i*) When the power factor is unity.
  - (*ii*) When the power factor is zero.
  - (*iii*) When the power factor is 0.5 lagging.

(b) A three phase, two element energy meter has a constant of 0.2 revolutions of disc per kWh. The meter is being used with a potential transformer of ratio 22 kV/220 V and a current transformer of ratio 100/5A.
If the line voltage is 220 V, current is 10 A, time to complete 10 revolutions is 30 seconds on unity power factor, determine the error expressed as a perentage of the correct reading.[7]

Or

- 4. (a) A wattmeter reads 5.54 kW when its current coil is connected in the red phase and its voltage coil is connected between red phase and neutral of a symmetrical three phase system supplying a balanced load of 30 A at 400 V. What will be the reading of the instrument if the connection of current coil remains unchanged and voltage coil is connected between yellow and blue phases ? The phase sequence is RYB. [7]
  - (b) Describe construction and working of single phase induction type energy meter with a neat diagram. [6]
- 5. (a) Explain the following terms associated with CRO : [6]
  - (*i*) Volts/division
  - (*ii*) X10
  - (*iii*) Invert.
  - (b) Define transducer. Explain in brief different types of transducers.[7] Or
- 6. (a) Describe briefly how the following measurements can be made with the use of CRO : [6]
  - (*i*) Frequency
  - (*ii*) Phase angle
  - (*iii*) Voltage.
  - (b) Explain McLeod gauge for measurement of pressure. [7]

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- 7. (a) Explain nucleonic method for level measurement with a suitable diagram. [6]
  - (b) Define strain. What are the types of strain gauge ? Explain wire strain gauge.[6]

- 8. (a) Explain electrical method for level measurement with a suitable diagram. [6]
  - (b) Explain the construction and principle of working of a Linear Variable Differential Transformer (LVDT). [6]

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## [5252]-146

# S.E. (Electrical) (Second Semester) EXAMINATION, 2017 POWER SYSTEM-I

## (2012 PATTERN)

**Time : Two Hours** 

### Maximum Marks : 50

N.B. := (i) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (iii) Figures to the right side indicate full marks.

(iv) Assume suitable data if necessary.

- 1. (a) Draw and explain procedure to plot load curve. What are its types ? What information is obtained from it ? [6]
  - (b) What are the different excitation systems for alternators?Explain any one in brief with a neat diagram. [6]

Or

- (a) A generating station supplies the following loads 15000 kW.
   12000 kW, 8500 kW, 6000 kW, and 450 kW. The maximum demand is 22000 kW. The annual load factor of the station is 48%. Calculate :
  - (i) the number of units supplied annually
  - (ii) diversity factor
  - (*iii*) demand factor. [6]
  - (b) With neat sketch explain function, construction, operating range and advantages of Suspension type insulator. [6]

- (a) Derive an expression for the inductance of a three-phase overhead transmission line when conductors are unsymmetrically spaced but transposed. [7]
  - (b) The weight of the overhead line conductor is 700 kg/km. The ultimate strength is 3000 kg. If safety factor is 2 and span length is 250 m. Find (i) Sag (ii) Height above which conductor should be supported if ground clearance required is 8 m. [6]
     Or
- 4. (a) Derive an expression for maximum and minimum dielectric stress in a single core cable. [6]
  - (b) A 50 Hz overhead line consisting of 3 conductors each of diameter 1.24 cm and spaced 2 m apart. Calculate inductance per phase per km for the following arrangement between conductors :
    - (*i*) Equilateral spacing
    - (*ii*) Horizontal spacing. Assume transposed line. [7]
- 5. (a) Derive an expression for capacitance of 3 phase transmission line when conductors are symmetrically spaced in the form of equilateral triangle. [6]
  - (b) A single phase line of 250 V, 50 Hz has conductor spacing of 1.5 meters. The diameter of each conductor is 1.5 cm. conductors are located 7 m above the ground. Calculate :
    - (i) Capacitance of line for length of 50 km and
    - (*ii*) Charging current

Considering the following conditions :

- (i) Without effect of earth
- (*ii*) With effect of earth. [7]

### [5252]-146

 $\mathbf{2}$ 

- 6. (a) What are method of images, with neat diagram derive the expression for single phase transmission line considering effect of earth.
  - (b) Three conductors of 33 kV, 50 Hz three-phase line are arranged in horizontal plane, 6 meters apart. Cross sectional area of each conductor is 1.207 em<sup>2</sup>, find capacitance and charging current for 100 km line in μF. [7]
- (a) With neat circuit diagram and phasor diagram, derive the relationship between sending end and receiving end quantities of medium transmission line considering 'T' model of the line.
  - (b) What is Ferranti effect ? Deduce a simple equation for voltage rise of a unloaded line. Draw necessary phasor diagram. [6]
     Or
- 8. (a) What is the effect of load power factor on regulation and efficiency of transmission line. [6]
  - (b) 3 phase, 132 kV, 50 Hz overhead transmission line has the following distributed constants :
    Resistance = 28 ohms, Inductive reactance = 63 ohms and Capacitive susceptance = 4 \* 10<sup>-4</sup> mho
    If the load at receiving end is 75 MVA at 0.8 p.f. lagging, determine sending end voltage using nominal π method. [6]

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## [5252]-147

## S.E. (Electrical) (Second Semester) EXAMINATION, 2017 ELECTRICAL MACHINES I

### (2012 **PATTERN**)

**Time : Two Hours** 

Maximum Marks : 50

- N.B. :- (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or No. Q. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Use of non-programmable scientific calculators is allowed.
  - (v) Assume suitable data if necessary.
- (a) Draw the phasor diagrams for 1\$\overline\$ transformer, when it is connected to :
  - (i) inductive load and
  - (*ii*) capacitive load. [6]
  - (b) Calculate the full load voltage regulation at power factor 0.8 lagging for the transformer having rating 300 kVA, 3300/400 V, 50 Hz, 1-ph with the following test data :
    S.C. test : 1200 W, 100 V ----- L.V. winding shorted with full load current in it. [6]

- (a) With a neat circuit diagram, explain the V-V connection of transformers. State its merits and demerits. [6]
  - (b) State and explain the conditions to be satisfied for parallel operation of 1-ph transformer. [6]
- 3. (a) Explain the role of commutator in DC Motor along with the diagram.
  - (b) Explain the construction of DC machine with neat diagram.Also state the function of each part in the DC machine.

[7]

#### Or

- 4. (a) A 5 kW, 230 V, DC shunt motor has full load line current of 25 A. The motor have Ra = 0.25 Ω and R<sub>sh</sub> = 230 Ω. Find constant losses for this machine. [6]
  - (b) With neat diagram, explain the methods of speed control of D.C. shunt motor. [7]
- 5. (a) Sketch and explain torque-speed characteristic for 3-phase induction motor. Also show the effect of an externally added resistance in the rotor circuit. [6]
  - (b) Explain power flow stages in case of three-phase induction motor along with the diagram and formulae. [6]

#### [5252]-147

 $\mathbf{2}$ 

- 6. (a) A 3.7 kW, 4 pole, 50 Hz, 3-phase induction motor has friction and windage losses of 4% of the output power. The full load slip is 4%. Calculate rotor copper loss and output torque of the induction motor. [6]
  - (b) What is the torque equation in case of an induction motor?Derive the condition for maximum running torque in case of induction motor. [6]
- 7. (a) Differentiate between squirrel cage and slip ring induction motor. [6]
  - (b) Draw the circuit diagram for conducting :
    - (i) No Load test and

(*ii*) Blocked rotor test on three-phase induction motor.How its equivalent circuit parameters are computed using these tests ?

- 8. (a) Write step by step procedure to draw circle diagram from No Load test and blocked rotor test on three-phase induction motor.
  - (b) Enlist various types of starters for three-phase induction motor.
     With neat sketch, explain autotransformer starter along with its merits and demerits. [7]

Seat	
No.	

## [5252]-148

Maximum Marks : 50

# S.E. (Electrical Enigneering) (Second Semester) EXAMINATION, 2017 NETWORK ANALYSIS

### (2012 PATTERN)

## Time : Two Hours

# N.B. :- (i) Answers Q. No. 1 or Q, No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6. Q. No. 7 or Q. No. 8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (iii) Figures to the right side indicate full marks.
- (iv) Use of calculator is allowed.
- (v) Assume suitable data if necessary.
- (a) Reduce the given network figure to a single voltage source and impedance. [6]



**Fig.** 1
(b) Obtain Norton's equivalent network between terminals A and B as shown in fig.2. [7]



## Fig. 2



**2.** (a) Find current through  $(3 - j4) \Omega$  by using Thvenin's Theorems as shown in fig (3). [7]



Fig. 3

(b) Find current through 5 ohm resistance by using Kirchhoff's voltage law.[6]



Fig. 4

**3.** (a) Find voltage V for t = 0.1 sec. after closing the switch at t = 0.



Fig. 5

(b) Write short note on initial and final condition, justify your answer. [6]

Or

4. (a) After being on position 1 for long time, the switch is thrown on position 2 at time t = 0, find current using Laplace Transform technique. [7]





(b) The switch is closed at time t = 0, obtain the particular solution for current i(t) usince Laplace Transform technique. Assume initial condition is zero. [6]



Fig. 7

5. (a) Find Z parameter for the circuit as shown in fig. 8. [6]



Fig. 8

 (b) In the circuit shown in fig.(9) find insertion loss in decibel in load resistance of 10 ohm, Inserted network is shown in dotted portion.



Fig. 9

- 6. (a) If a constant k high-pass filter has cut-off frequency of 13 kHz and nominal impedance of  $R_0 = 600$  ohm, design the T and  $\pi$  sections of this filter. [6]
  - (b) Obtain Z parameter of network as shown in fig (10). [6]



Fig. 10

7. (a) Find Transfer Function of network as shown in fig. (11). [6]



- Fig. 11
- (b) Draw the time domain wave form for various types of transferfunction and comment on stability of system. [6]

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8. (a) Find poles and zero of the impedance of the following network and plot them on the s – plane in fig. 12. [6]



Fig. 12

(b) Explain parallel resonance, condition drive the formula for antiresonant frequency. [6]

Seat	
No.	

## [5252]-149

## S.E. (Electrical) (Second Semester) EXAMINATION, 2017 NUMERICAL METHODS AND COMPUTER PROGRAMMING (2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

- **N.B.** :- (i) Neat diagrams must be drawn wherever necessary.
  - (ii) Figures to the right indicate full marks.
  - (iii) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (iv) Assume suitable data, if necessary.
- (a) Explain the use of array. What are different types of array ? Describe each in detail with example. [6]
  - (b) It is given that  $a = 10.00 \pm 0.05$ ,  $b = 0.0356 \pm 0.002$ . Find the relative error in the following operations : [6] (i) a - b(ii) ab

## Or

- **2.** (a) Explain the functions of relational and logical operators. [6]
  - (b) Find the real root of equation  $x^4 3x^3 + 3x^2 3x + 2 = 0$ using Birge-Vieta method. Take  $P_0 = 0.5$ . Show two iterations only. [6]

**3.** (a) Find the values of a, b and c such that  $y = ax^2 + bx + c$  is the best fit to the following data : [6]

x	0	1	2	3	4
у	1	0	3	10	$\overline{21}$

(b) Using appropriate interpolation technique find y at x = 4.5[7]

y 2.38 3.65 5.85 9.95 14.85	x	1	2	3	4	5
	У	2.38	3.65	5.85	9.95	14.85

- 4. (a) Find the real root of  $2x^2 3\sin x 5 = 0$  correct upto four decimal places with initial value of  $x_0 = 1$  using Newton-Raphson method. [6]
  - (b) Find the interpolating polynomial using Newton divided difference formula for the following data. Hence find y(4): [7]

x	1	2	3	5
у	0	7	26	124

5. (a) Solve the following system of equation using Gauss-Jacobi Method upto 5th iteration with x = y = z = 0: [6]

20x + y - 2z = 17

- 8x + 20y z = -18
- 2x + 3y + 20z = 25.

(b) Find  $[A]^{-1}$  using Gauss-Jordan method : [6]

$$\mathbf{A} = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$$

#### Or

6. (a) Find numerically, the largest eigen value of [6]

$$A = \begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix}$$
 by power method.

Take 
$$x_0 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$
 (upto 3rd iteration only).

(b) Explain Gauss elimination method. What is need of partial pivoting ? [6]

7. (a) Find out the solution of  $y' = 2y + 3e^x$  using Taylor's series with y(0) = 1. Find out value of y for x = 0.1 and x = 0.2. [7]

(b) Evaluate  $\int_{0}^{\pi/2} e^{\sin x} dx$  using Simpson's (3/8)<sup>th</sup> rule with 6 subintervals. [6]

P.T.O.

[5252]-149

3

8. (a) Compute 
$$y(0.1)$$
 and  $y(0.2)$  from [7]

Or

$$\frac{dy}{dx} = y - \frac{2x}{y}$$
 with  $y(0) = 1$  by modified Euler's method.

(b) Use Simpson's  $(1/3)^{rd}$  rule evaluate [6]

$$\int_{0}^{12} \log_{e}(1+x^{2}) \text{ taking } h = 2.$$

Seat	
No.	

## [5252]-150

## S.E. (Electrical)(Second Semester) EXAMINATION, 2017 FUNDAMENTALS OF MICROPROCESSOR AND MICROCONTROLLER

## (2012 PATTERN)

 Time : Two Hours
 Maximum Marks : 50

 N.B. :- (i)
 Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6,

 Q. 7 or Q. 8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (*iii*) Figures to the right indicate full marks.

1. (a) Explain the function of register Stack pointer and Accumulator. [6]

(b) Write an assembly language program for 8085, to interchange the contents of memory locations 9000H and 9001H. [6]

Or

- **2.** (a) Explain with an example any *three* addressing modes of 8085.[6]
  - (b) Explain the flag register of 8085. [6]
- 3. (a) Draw and explain the control word register of 8255. [6]
  (b) Explain the functions of the following pins of 8051 : [6]
  - (i) ALE
  - (ii) RST.

- 4. (a) Draw the TCON register and explain the individual bits of the register in detail. [6]
  - (b) Draw the functional block diagram of 8254 PPT and explain the function of each block. [6]
- 5. (a) Explain the following instructions in detail : [6]
  (i) MOV @R0,A
  - (*ii*) MOV A,#09H.
  - (b) Explain steps to be followed to receive data serially in 8051.

[7]

#### Or

- 6. (a) Write a program to add the contents of R0 and R1 of bank
  0 of 8051 and store the result of addition at a location 8100H in external data memory. [6]
  - (b) Write a short note on interrupt structure of 8051. [7]
- 7. (a) A stepper motor is interfaced with 8051 through a driver card. The motor is controlled through most significant 4 bits of Port
  2. The step angle of the motor is 1.8 degrees. Write a program to run the motor in anticlockkwise direction through an angle of 180 degrees. The excitation sequence is 05H, 09H, 0AH, 06H.
  - (b) With a neat diagram explain the measurement of energy using 8085.[5]

8.	<i>(a)</i>	With a	a neat	diagram	explain	how	power	factor	can	be	measured
		using	8085.								[6]

(b) With a neat diagram explain temperature measurement using8051 microcontroller. [7]

Or

Seat	
No.	

## [5252]-151

## S.E. (Instrumentation & Control) (First Semester) EXAMINATION, 2017 SENSORS AND TRANSDUCERS

#### (2012 PATTERN)

#### Time : Two Hours

## Maximum Marks : 50

- **N.B.** :- (i) Neat diagrams must be drawn wherever necessary.
  - (*ii*) Figures to the right indicate full marks.
  - (iii) Assume suitable data, if necessary.
- (a) Define transducer. Explain in detail the classification of transducer. [6]
  - (b) Explain strain gauge type load cell for force measurement with neat diagram.[6]

#### Or

- 2. (a) Explain the working principle of encoder in detail. Also, explain their types with application. [6]
  - (b) Explain piezoelectric sensor in detail. Explain any two applications with diagram. [6]
- (a) List different techniques for differential pressure measurement.
   Explain the working of any one of them in detail. [6]
  - (b) Explain working principle of thermocouple and necessity of cold junction compensation for temperature measurement. [6]

4.	( <i>a</i> )	Define absolute pressure and gauge pressure. Draw and explain
		pressure measurement using any one type of elastic trans-
		ducer. [6]
	( <i>b</i> )	Explain bimetallic thermometers with neat diagram. [6]
5.	( <i>a</i> )	Explain the working principle of Rotameter for flow measure-
		ment with neat diagram. [7]
	( <i>b</i> )	Derive the Bernoulli's equation for incompressible flow. [6]
		Or
6.	(a)	Explain orifice plate in detail for measurement of flow. [7]
	( <i>b</i> )	Explain electromagnetic flowmeter with neat diagram. [6]
7.	( <i>a</i> )	Define density. Discuss Air Bubbler system for measurement
		of density with neat diagram. [7]
	( <i>b</i> )	Draw and explain pH measurement system in detail. [6]
		Or
8.	<i>(a)</i>	Define viscosity. Explain any one method for viscosity mea-
		surement. [7]
	( <i>b</i> )	List different level measurement techniques. Explain ultrasonic
		sensor for level measurement. [6]

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 $\mathbf{2}$ 

Seat	
No.	

## [5252]-152

S.E (Instrumentation and Control Engineering) (I Sem.) EXAMINATION, 2017 LINEAR INTEGRATED CIRCUITS

### (2012 PATTERN)

 Time : Two Hours
 Maximum Marks : 50

 N.B. :-- (i)
 Solve Q.1 Or Q.2, Q.3 Or Q.4, Q.5 Or Q.6, Q.7 Or Q.8.

(*ii*) Figures to the right indicate full marks.

- 1. (a) Define any six characteristics of Op-amp with ideal and practical values. [6]
  - (b) Explain the advantages of closed loop op-amp. Explain unity gain amplifier with neat circuit diagram. [6]

#### Or

- (a) Design a circuit for non-inverting amplifier with gain of 2.5.
   Assume swing of op-amp is ± 13 volts. What maximum input voltage can be given so that op-amp will not saturate ?[6]
  - (b) (i) Draw equivalent circuit of operational amplifier.
    - (*ii*) What are the characteristics of ideal op-amp ? [6]
- (a) Derive equation for gain of Instrumentation amplifier and draw circuit diagram of instrumentation amplifier with bridge network.
  - (b) With a neat labelled diagram explain working of precision full wave rectifier. [6]

#### Or

(a) Explain with neat circuit diagrams and equations, limitations of basic Integrator and how it can be overcome by practical Integrator.
 [6]

- (b) Explain Window detector with neat circuit diagram and waveforms.[6]
- (a) How astable multivibrator using IC 555 works ? Why can it not generate duty cycles less than 50% ? How is this problem overcome ? Justify your answer with derivation for astable multivibrator. [8]
  - (b) List the advantages of switching regulator. [5]

#### Or

- 6. (a) Explain Mono-stable multivibrator using IC 555 with neat circuit diagrams. [5]
  - (b) Explain step-down switching regulator. Also state its advantages over linear regulators. [8]
- 7. (a) Design an active first order low pass Butterworth filter of cut-off frequency 10 kHz. Assume passband gain of 2. Draw the circuit diagram.
  - (b) Compare active and passive filter. [5]

Or

- 8. (a) Explain notch filter using Op-amp and draw circuit diagram and response. [6]
  - (b) Design first order High-pass filter for the low cut-off frequency of 500 Hz. Assume suitable data. Draw neat circuit diagram.
     [7]

Seat	
No.	

## [5252]-153

Maximum Marks : 50

## S.E. (Instrumentation and Control) (First Semester) EXAMINATION, 2017 BASIC INSTRUMENTATION

## (2012 COURSE)

## **Time : Two Hours**

- **N.B.** :- (i) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8. (ii) Figures to the right side indicate full marks.

  - (iii) Neat diagrams must be drawn wherever necessary.
  - (iv) Use of Calculator is allowed.
  - (v) Assume suitable data, if necessary.
- (a) In PMMC instrument prove that the final deflection 'θ' is proportional to the input current, 1. [6]
  - (b) Explain the dynamic characteristics of instruments. [6]

### Or

- **2.** (a) Write a note on calibration and methods of calibration. [6]
  - (b) Draw neat circuit diagram of DC potentiometer and explain how unknown emf can be measured. Also write the procedure of calibration.
     [6]
- 3. (a) What is delay line ? State its need. Explain with appropriate diagram any type of delay line. [6]
  - (b) Derive the equations for unknown inductance and its associated resistance in Maxwell inductance capacitance bridge. [6]

## Or

4. (a) Explain the operation of ALT and CHOP modes in dual trace CRO. Also draw the waveforms. [6]

#### (b) In case of Wheatstone bridge as shown below :



 $R_a = 3.5 \text{ k}\Omega$ ,  $R_1 = 7 \text{ k}\Omega$ ,  $R_b = 4 \text{ k}\Omega$  and  $R_2 = 2 \text{ k}\Omega$ . If bridge supply is E = 10 volt and null detector's resistance is 2500  $\Omega$ , calculate current flowing through null detector.

5.

(a) How can phase difference be measured with digital phase meter ?

(b) Draw block diagram of digital thermometer and explain its operation.

#### Or

**6.** (*a*) With appropriate block diagram, explain the digital kWh meter.[7]

- (b) Why to prefer digital instruments over analog instruments? [6]
- (a) Speed-torque characteristics of a DC motor is to be plotted.
   Suggest a suitable instrument. Draw block diagram and explain its working. [7]

[5252]-153

[6]

 (b) What are the desirable characteristics of a function generator ? Draw block diagram of it. Draw the circuit that converts triangular wave into sine wave.

Or

- 8. (a) Differentiate between virtual instrument and traditional instrument. [6]
  - (b) Draw the diode-resistor wave shaping circuit for converting triangular into sine wave. Explain its working with suitable waveform.

Time : Two Hours

Seat	
No.	

## [5252]-154

Maximum Marks : 50

# S.E. (Instr. & Cont.) (I semester) EXAMINATION, 2017 PHOTONICS & INSTRUMENTATION

## (2012 PATTERN)

N.B. :- (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No.
4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

- 1. (a) Draw electromagnetic spectrum of light and show different ranges. [8]
  - (b) State Maul's law. [4]

Or

- 2. (a) A light source of wavelength  $\lambda = 0.53$  µm is used in laboratory. Calculate the energy in electron volt. [6]
  - (b) Calculate the Brewster angle for glass having refractive index in air is 1.5. (Assume : air refractive index = 1) [6]
- **3.** (a) Define Optical Detector. List the different Thermal Detectors.[4]
  - (b) Explain the working construction of Incandescent Lamp. [8]

Or

4. (a) What is Quantum detector ? List the different Quantum detectors. [4]

- (b) Explain in short :
  - (*i*) Photo transistor
  - (*ii*) Photo diode
- 5. (a) Compare the different losses in Fiber optic cable. [7]

 $[4 \times 2]$ 

[6]

- (b) Explain the terms of Fiber cable
  - (i) Acceptance angle
  - (*ii*) Numerical aperture.

#### Or

- 6. (a) What is wave guiding principle ? Explain the term skew rays.[6]
  - (b) What are different modes used in fiber optics. Explain with diagram. [7]
- 7. (a) Explain astronomical telescope with diagram. [7]
  - (b) Explain the basic principle of Holography. [6]

## Or

- 8. (a) Explain with suitable diagram Microscope. [7]
  - (b) Explain working principle of Camera with suitable diagram.[6]

Seat	
No.	

## [5252]-155

## S.E. (Instrument & Cont.) (II Semester) EXAMINATION, 2017 TRANSDUCERS AND SIGNAL CONDITIONING

#### (2012 **PATTERN**)

## **Time : Two Hours**

## Maximum Marks : 50

- **N.B.** :— (i) Neat diagrams must be drawn wherever necessary.
  - (ii) Figures to the right indicate full marks.
  - (*iii*) Your answers will be valued as a whole.
  - (iv) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (v) Assume suitable data, if necessary.
- (a) Design signal conditioning circuit for temperature indicator using PT100 with coefficient of temperature as 0.0039 ohm/deg Celsius. Write the following specifications : Range : 50 - 200 Deg. Celcius Output : 0-500 mV.
  - (b) Explain need of signal transmission in signal conditioning : [4] Or
- 2. (a) Design signal conditioning circuit for potentiometric sensor for level measurement with the following specifications :
  - change in Sensor resistance : 2 kohm to 2.6 kohms
  - output : 0–1 V [8]

- (b) Explain need of lead wire compensation in signal conditioning for RTD. [4]
- 3. (a) Explain excitation techniques for capacitive sensor.What are the limitations of this type of sensor ? [6]
  - (b) Explain use of phase sensitive rectifier in signal conditioning scheme for Linear Variable Differential Transformer (LVDT). [6]

#### Or

- (a) Explain the functional blocks of signal conditioning used for inductive sensor for speed measurement. [6]
  - (b) What are the advantages and limitations of *three* basic methods of detection used for capacitive sensors. [6]
- (a) Explain how a photo transister can be used for optical proximity switch.
  - (b) Explain principle of radiation pyrometer with neat block diagram.

#### Or

- 6. (a) Explain why modulated infrared light beam is used for signal conditioning of optical proximity switch ? [7]
  - (b) Explain signal conditioning scheme used for absolute encoder.[6]
- (a) How the "time of flight" technique used for measuring level of a liquid in a tank ? Explain with timing diagram. [7]

(b) Explain necessity of cold junction compensation circuit used in signal conditioning of thermocouple. [6]

Or

- 8. (a) Design a signal conditioning circuit for thermocouple with the following specifications : Thermocouple sensivity 50 Microvolts ideg Celsius, Temperature range : 20 deg. to 200 deg, Celcius, output : 0 to 1 V (Assume cold junction is at 0 deg. Celcius). [7]
  - (b) Explain why an Alternating Current (AC) signal is used for signal conditioning scheme of conductivity meter. [6]

Seat	
No.	

## [5252]-156

## S.E. (Inst. & Control) (Second Semester) EXAMINATION, 2017 ELECTRONIC INSTRUMENTATION

## (2012 COURSE)

- Time : Two Hours
   Maximum Marks : 50

   N.B. :- (i)
   Solve Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.
  - (ii) Figures to the right side indicate full marks.
  - (iii) Neat diagrams must be drawn wherever necessary.
  - (iv) Use of calculator is allowed.
  - (v) Assume suitable data, if necessary.
- 1. (a) Describe how auto-ranging and auto-zeroing takes place in DMM. [6]
  - (b) Explain working of Arbitrary Waveform Generator (AWG) with neat block diagram. [6]

Or

- 2. (a) For a pulse generator if the internal period of a pulse generator that operates in the gate mode is set to 20 ns and a positive pulse with a duration of 200 ns is stimulating the external trigger input, find the pulse generator pulses. [6]
  - (b) A frequency counter with an accuracy of ± 1 LSD ± (1 × 10<sup>-6</sup>) is employed to measure frequencies of 200 Hz, 2 MHz and 200 MHz. Calculate the percentage measurement error in each case.
     [6]
- **3.** (a) Explain 1 : 1 and 10 : 1 passive probes used in oscilloscope with neat diagram. [6]
  - (b) Find the SAR type ADC output for a 4-bit convertor to a 4.217 V input if the reference is 5 Volts ? [6]
     P.T.O.

- 4. (a) What is delay line ? Explain distributed parameter delay line of oscilloscope. [6]
  - (b) Explain 4-bit R-2R type DAC with neat circuit diagrams. [6]
- 5. (a) What is data transmission or modulation in instrumentation point of view ? Describe with block diagrams. [7]
  - (b) What is the bandwidth required for an FM signal in which the modulation frequency is 2.5 KHz and the maximum deviation is 14 KHz ?
     [6]

#### Or

- 6. (a) What is modulating and modulated signals ? Draw AM and FM waveforms with modulating signal. [7]
  - (b) Write short notes on : [6]
    - (i) FSK (Frequency Shift Keying)
    - (*ii*) Amplitude division multiplexing (ADM).
- (a) What is the use of wave analyzer ? Explain frequency selective wave analyzer with neat block diagram. [7]
  - (b) Draw waveform with harmonics. Explain harmonic analyzer with neat block diagram. [6]

#### Or

- 8. (a) What is difference between CRO and spectrum analyzer ? Explain any *one* type spectrum analyzer with neat diagram. [7]
  - (b) Draw and explain rejection amplifier circuit in harmonic analyzer. [6]

Seat	
No.	

## [5252]-157

## S.E. (Instrumentation and Control) (Second Semester) EXAMINATION, 2017 AUTOMATIC CONTROL SYSTEMS

## (2012 PATTERN)

## **Time : Two Hours**

## Maximum Marks : 50

- N.B. :- (i) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.
- (a) Explain different types of control system with suitable example. [6]
  - (b) Define the following terms w.r.t. Signal Flow Graph with suitable example : [6]
    - (i) Source Node
    - (*ii*) Sink Node
    - (iii) Chain Node
    - (iv) Dummy Node
    - (v) Path Gain
    - (vi) Non-touching Loop.

2. (a) Find out the Transfer function of R-L-C network as shown in Fig. 1. [6]





(b) Obtain equivalent electrical circuits for the given mechanical systems in Fig. 2, using Force to voltage and Force to current analogy.



Fig. 2.

**3.** (a) Define the following terms with respect to control system:

 $\mathbf{2}$ 

- (i) Poles
- (ii) Zeros.
- (iii) Characteristic equation

- (*iv*) Order
- (v) Type
- (vi) Pole-Zero Plot. [6]
- (b) Determine time response specifications for a unit-step input to a unity feedback system having  $G(s) = \frac{144}{s(s+12)}$ . [6]
  - Or
- **4.** (*a*) For a unity feedback control system having open-loop Transfer Function

$$G(s) = \frac{K}{s(1+0.6s)(1+0.4s)}$$

Determine the range of values of K, marginal value of K and frequency of sustained oscillations. Use Routh's stability method. [4]

(b) Plot the root locus of a unity feedback system whose forward transfer function is given by

$$G(s) = \frac{K}{s^2 + 10s + 100}.$$
 [8]

5. (a) Find frequency domain specifications for a system having  $G(s) = \frac{81}{s(s+18)}$ 

with unity feedback.

(b) A unity feedback control system has  $G(s) = \frac{1000}{s(s+100)}$ . Draw the

Bode Plot and comment on the stability. [9]

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[4]

Or

- 6. (a) Write correlation between time domain and frequency domain specifications. [4]
  - (b) Draw the Bode plot for a unity feedback control system having  $G(s) = \frac{1000}{(s+100)}.$ [9]
- 7. (a) Explain Nyquist stability criterion. [5]

(b) Consider a system with open loop transfer function as  

$$G(s)H(s) = \frac{10}{s}$$
. Obtain its polar plot. [8]

Or

8. (a) Explain how type of system determines nature of polar plot. [5]

$$G(s)H(s) = \frac{k}{s(s+2)(s+10)}$$
 sketch the Nyquist plot. [8]

**Time : Two Hours** 

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Maximum Marks : 50

# S.E. (Instrumentation and Control) (Second Semester) EXAMINATION, 2017 DIGITAL TECHNIQUES

## (2012 PATTERN)

N.B. := (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q 8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (*iii*) Figures to the right side indicate full marks.
- (iv) Assume suitable data if necessary.
- **1.** (*a*) Convert the following :
  - (i) (4AC)<sub>16</sub> to Decimal
  - (ii)  $(110010110)_2$  to decimal
  - (iii)  $(46)_{10}$  to Binary
  - (b) Write a short notes on Current sinking action in TTL LogicFamily [6]

#### Or

- **2.** (a) Convert the following :
  - (i) (3509)<sub>10</sub> to Hexadecimal equivalent
  - (ii)  $(177)_{10}$  to Octal
  - (iii) Find the 2s Complements of 110011100

[6]

	(b)	Define the following terms : [6]
		(i) Figure of merit
		(ii) I <sub>ol</sub>
		( <i>iii</i> ) Noise Immunity [6]
3.	( <i>a</i> )	Design the following expression using NAND-NAND Logic.
		$Y = \Sigma m (0, 1, 5)$ [6]
	( <i>b</i> )	Design 16 : 1 Multiplexer using 4 : 1 Multiplexer
		Or
4.	( <i>a</i> )	Convert JK flip-flop to D flip-flop [6]
	( <i>b</i> )	Design 3-bit synchronous counter using T-flip-flop [6]
5.	( <i>a</i> )	Design gray to binary convertor using PLA [8]
	( <i>b</i> )	Write short note on Flash Memory. [5]
		Or
6.	<i>(a)</i>	Explain architecture of 8085 microprocessor with neat
		sketch. [8]
	( <i>b</i> )	Write short notes on (any one) : [5]
		(i) Address bus
		(ii) Control bus
7.	( <i>a</i> )	Explain frequency counter with neat sketch. [8]
	( <i>b</i> )	Write short note on Bubble memory. [5]
		Or
8.	( <i>a</i> )	Explain Digital Clock with neat sketch. [8]
	( <i>b</i> )	Write short note on EEPROM [5]

Seat	
No.	

## [5252]-159

## S.E. (Instrumentation and Control) (Second Semester) EXAMINATION, 2017 INDUSTRIAL DRIVES (2012 PATTERN)

# Time : Two Hours Maximum Marks : 50 N.B. :- (i) Solve Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.

- (ii) Figures to the right indicate full marks.
- (iii) Neat diagrams must be drawn wherever necessary.
- (*iv*) Use of calculator is allowed.
- (v) Assume suitable data, if necessary.
- 1. (a) Draw and explain V-I characteristics of SCR. What is latching current and holding current ? [6]
  - (b) Explain with neat circuit diagram single phase full bridge inverter. Draw waveforms. [7]

Or

(a) Classify the choppers. Explain John's chopper. [6]
(b) Explain the single phase half-controlled bridge rectifier with RL load. [7]

**3.** (a) With suitable diagram explain the working of DC generator. [6]

- (b) Derive the torque equation of three-phase induction motor. [6] Or
- **4.** (a) Explain why DC series motor damages mechanically if it started on no load. [6]
  - (b) Write short note on speed control of induction motor. [6]

- 5. (a) Explain the working principle and construction of alternators. [6]
  - (b) Explain the construction and working principle of synchronous motor. [6]

Or

- 6. (a) Explain the working principle and construction of single phase induction motors. [6]
  - (b) Explain torque-speed characteristics of single phase induction motor. [6]
- 7. (a) Explain construction and working principle of stepper motor. [6]
  - (b) Explain the types of D.C. servomotors in detail. [7] Or
- 8. (a) Classify the stepper motors. Explain any one in detail. [7]
  - (b) Explain construction and working principle of universal motor. [6]

Seat	
No.	

## [5252]-161

## S.E. (Com. Engg.) (First Semester) EXAMINATION, 2017 DISCRETE STRUCTURES (2012 COURSE)

# Time : Two Hours Maximum Marks : 50 N.B. : (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (*iii*) Figures to the right indicate full marks.
- (iv) Assume suitable data, if necessary.
- 1. (a) Show that  $n^3 + 2n$  is divisible by 3, for all n > = 1 using mathematical induction. [4]
  - (b) Prove whether the following statements are logically equivalent or not ?
    - (i)  $p \rightarrow q$  and  $\sim p \wedge \sim q$
    - (*ii*)  $\sim$ (p  $\land$  q) and  $\sim$ p  $\land$   $\sim$ q. [4]
  - (c) Define cardinality. What is the cardinality of the following sets : [4]
    - (*i*) I = {.....-4, -3, -2, -1, 0, 1, 2, 3, 4 .....}
    - (*ii*) NXN, N is a set of natural numbers.
    - (iii) Union of finite numbers of countable sets.

#### Or

2. (a) f(x) = ax + b and g(x) = cx + d where a, b, c, d are constants. Determine for which constant a, b, c, d it is true that fog = gof. [4]

- (b) Show that the relation y = 2x + 3 from  $R \rightarrow R$  is a function. [4]
- (c) In a school, 2000 students were asked whether they like science or maths. It was found that 1200 like science and 900 like maths and 400 like both. How many like at least one subject and how many none ?

[5]

- **3.** (a) Define :
  - (i) Ring
  - (ii) Ring Homomorphism
  - (iii) Ring Isomorphism
  - (iv) Integral domain
  - (v) Semi-Group
  - (b) Discuss about permutation groups and coding theory. [4]
  - (c) State whether the following graphs in Fig. 3. (c) are isomorphic or not. [4]



Fig. 3 (c)

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 $\mathbf{2}$
4. (a) Apply Dijkstra's shortest path algorithm to find the shortest path between vertices and z in the Fig. 4. (a) below : [6]





- (b) Determine the number of edges in a graph with 6 nodes, 2 of degree 4 and 4 of degree 2. Draw two such graphs. [4]
- (c) Let G be the set of all non-zero real numbers and let a\*b = ab/2. Show that (G, \*) is an Abelian group. [3]
- 5. (a) Find the maximum flow in the transport network shown in Fig. 5. (a) using labeling procedure. Determine the corresponding minimum cut.



Fig. 5 (a)

3

(b) For each of the following sets of weights construct an optimal binary prefix code. For each weight in the set give the corresponding code word 10, 11, 14, 16, 18, 21. [6]

P.T.O.

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Or

- 6. (a) Define and explain the following terms with reference to tree with example : [6]
  - (i) Level and height of the tree
  - (*ii*) M-ary tree
  - (*iii*) Eccentricity of the tree.
  - (b) Define Spanning sub-graph and minimum spanning tree. Use Kruskal's Algorithm to find minimum spanning tree for the graph.
     [6]



Fig. 6 (*b*)

- 7. (a) A bag contain 3 red and 4 black pebbles and second bag contains 6 red and 4 black pebbles. A pebble is thrown from each bag. Find the probability that : [7]
  - (i) Both are red
  - (*ii*) Both are black
  - (iii) One is red and one is black.
  - (b) A, B, C throw a fair coin in that order one who throws a head first wins. Find the probabilities of their winning. [6]

- 8. (a) There is a pack of 52 cards : [7]
  - (i) If one card is drawn at random from each of two decks, then what is the probability that at least one is the ace of hearts ?

- (ii) If cards are drawn one by one without replacement, then what is the probability that the first ace will be drawn in the 10th draw ?
- (b) If P(A) = 3/8, P(B) = 1/3 and  $P(A \cup B) = 1/4$ , then find:
  - (i) P(A') and P(B')
  - (ii) P(A  $\cup$  B)
  - (iii)  $P(A' \cup B')$
  - $(iv) P(A' \cap B').$  [6]

Total No. of Questions-8]

Seat	
No.	

# [5252]-162

## S.E. (Computer Engineering) (First Semester) EXAMINATION, 2017 DATA STRUCTURES AND PROBLEM SOLVING (2012 PATTERN)

**Time : Two Hours** 

Maximum Marks : 50

- - (ii) Neat diagrams must be drawn whenever necessary.
  - (iii) Figrues to the right indicate full marks.
  - (iv) Use of calculator is allowed.
  - (v) Assume suitable data, if necessary.
- 1. (a) Represent the following binary tree using arrays : [4]



(c) Sort the following data using quick sort in ascending order: 50, 30, 10, 90, 80, 20, 40, 70 [4]

Or

(a) What is Binary Search Tree ? Write inorder, preorder and postorder traversal of the following tree : [4]



- (b) Explain various Asymptotic notations. [3]
- (c) Explain the terms inorder successor and inorder predecessorwith respect to threaded binary tree. [2]
- (d) Sort the following elements using radix sort in ascending order.Show all the steps.

35, 40, 7, 5, 50, 120, 99 [3]

- **3**. (a) What is Hashing ? Explain hashing methods with example. [4]
  - (b) Explain topological sorting with example. [4]
  - (c) Find Minimum Spanning Tree for the following graph using Kruskal's algorithm. [4]



- Or
- 4. (a) Insert the following data in the hash table of size 10 using linear probing with chaining without replacement : [6] 131, 3, 4, 21, 61, 6, 71, 8, 9
  - (b) Explain various Graph storage structures. [6]
- 5. (a) Write algorithm to search an element in B tree. [6]
  - (b) Sort the following data in ascending order using heap sort: [4] 15, 10, 40, 25
  - (c) List and explain any *three* operations carried out on sequential file. [3]

- 6. (a) Write a pseudo C/C++ code to sort data using heap sort. [6]
  - (b) Construct 5-way binary tree for the following data : [7] 78, 21, 14, 11, 97, 85, 74, 63, 45, 42, 57, 20, 16, 19
- 7. (a) Write a parallel algorithm for odd-even merge sort. [7]
  - (b) Explain pointer doubling problem with example. [6]

#### Or

- 8. (a) Explain prefix computation problem with example. [6]
  - (b) Write a parallel algorithm to perform addition of given numbers using complete binary tree method. [7]

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3

Total No. of Questions—8]

[Total No. of Printed Pages-3

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No.	

# [5252]-163

# SE (Computer) (I Sem.) EXAMINATION, 2017 DIGITAL ELECTRONICS AND LOGIC DESIGN (2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

- N.B. :- (i) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 and Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (*iv*) Use of Mollier charts, electronic pocket calculator and steam tables are allowed.
  - (v) Assume suitable data, if necessary.
- 1. (a) Minimize the following function using K-map and realize using logic gates : [4]

 $F(A, B, C, D) = \Sigma m(1, 5, 7, 13, 15) + d(0, 6, 12, 14).$ 

(b) Convert the following :

$$(175)_{10} = (?)_8$$

(c) List the differences between CMOS and TTL. [6]

Or

- 2. (a) Convert the following numbers into binary numbers : [4] (i)  $(37)_8$ (ii)  $(25.5)_{10}$ 
  - (b) Explain the standard TTL characteristics in detail. [6]

P.T.O.

[2]

- (c) Represent the following signed number in 2's complement method : [2]
  (i) +17
  (ii) -17.
- (a) Explain rules for BCD addition with suitable example and design a single digit BCD adder using IC 7483.
  - (b) Design a MOD-6 synchronous counter using J-K flip-flops. [6]

4. (a) Design a sequence generator using J-K flip-flop sequence is : [6]

 $1 \rightarrow 3 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 1.$ 

- (b) Design a circuit to convert 4-bit binary to its equivalent gray code.[6]
- 5. (a) What is ASM chart ? Give its application and explain the MUX controller method with suitable example. [7]
  - (b) Write VHDL code for 4-bit adder using structural modelling style. [6]

### Or

- 6. (a) Draw the ASM chart for the following state machine. A 2-bit up counter is to be designed with output  $Q_A Q_B$ and enable signal 'X'. If X = 0, then counter changes the state as 00-01-10-11-00. If 'X' = 1, then counter should remain in current state. Design the circuit using J-K flip-flop and suitable MUX. [7]
  - (b) Write a VHDL code for 8 : 1 MUX using Behavioural modeling. [6]

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7. (a) Draw and explain basic architecture of FPGA in detail. [6]

(b) A combinational circuit is defined by the functions : [7]

$$f_1(A, B, C) = \Sigma m(3, 5, 7)$$
  
 $f_2(A, B, C) = \Sigma m(4, 5, 7)$ 

Implement the circuit with PLA having 3 input and 3 product term with 2 output.

## Or

8.	( <i>a</i> )	Implement 4 : 1 MUX using PAL.	[6]
	( <i>b</i> )	Implement the following functions using PLA :	[7]
		$f_1(A, B, C) = \Sigma m(0, 3, 4, 7)$	
		$f_2(A, B, C) = \Sigma m(1, 2, 5, 7).$	

Total No. of Questions-8]

Seat	
No.	

# [5252]-164

# SE (Computer Engineering) (First Semester) EXAMINATION, 2017 OPERATING SYSTEM AND ADMINISTRATION (2012 PATTERN)

## Time : Two Hours

## Maximum Marks : 50

- N.B. :- (i) Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 and Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.
- 1. (a) What is the use of operating system ? Explain the operating system services. [6]
  - (b) Explain the three levels of unix architecture. [6]

## Or

- 2. (a) What do you mean by user perspective ? Explain the file system structure with the help of diagram. [6]
  (b) Write short notes on : [6]
  (i) V-node and I-node tables
  (ii) Sleep and Wake up
  (iii) Block IO devices and Raw IO devices.
- **3.** (a) Explain mounting and unmounting. How new file system is mounted and unmounted in UNIX ? [6]
  - (b) What is bootstrapping ? Explain the different phases of the bootstrapping. [6]

- 4. (a) Explain the different types of files in Unix. Describe pathname in unix operating system. [6]
  - (b) What is the Perl programming ? How to create and access the array elements in the Perl programming with an example. [6]
- 5. (a) What is process ? Explain the life cycle of process in detail. [7]
  (b) Explain different signals in Unix. [6]

- 6. (a) Explain the following commands in detail : [6] (i) strace
  - (*ii*) truss
  - (*iii*) tusc.
  - (b) Explain the types of runaway processes. How kill and signal can be used to deal with runaway processes ? [7]
- 7. (a) Explain the different levels of the RAID model with a neat diagram. [7]
  - (b) Explain the advantages and disadvantages of multiple partitions. [6]

Or

- 8. (a) Explain the relationship between various elements of the LVM with the help of neat diagram. [6]
  - (b) What is the extended file system ? Explain the different extended file system in detail. [7]

Total No. of Questions—8]

Seat	
No.	

# [5252]-165

# S.E (Computer Engineering) (I semester) EXAMINATION, 2017 MICROPROCESSOR ARCHITECTURE

## (2012 PATTERN)

Time	• : T	wo Hours Maximum Marks : 50
<i>N.B.</i>	:—	(i) Answer any <i>four</i> questions, Q.No. 1 or Q.No. 2, Q.No. 3
		or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No. 7 or Q.No. 8.
		( <i>ii</i> ) Neat diagrams must be drawn whenever necessary.
		( <i>iii</i> ) Figures to the right indicate full marks.
		( <i>iv</i> ) Assume suitable data, if necessary.
1.	( <i>a</i> )	How many segment registers are used by 8086 ? Mention their
		use. [3]
	( <i>b</i> )	Explain memory organization and segmentation in 80386DX.[6]
	( <i>c</i> )	What is TSS descriptor ? [3]
		Or
2.	( <i>a</i> )	Explain the difference between 8086 and 80386. [3]
	( <i>b</i> )	Explain the various data types supported by 80386DX. [6]
	( <i>c</i> )	What is LDT descriptor ? [3]
3.	( <i>a</i> )	What is the use of bit test and modify instructions ? [3]
	( <i>b</i> )	Draw the timing diagram for read cycle with non-pipelined
		address. [6]
	( <i>c</i> )	How to define and use macro in assembly language
		programming ? [3]
		Or
4.	( <i>a</i> )	Enlist program flow control instructions. [3]

- (b) Draw the timing diagram for write cycle with non-pipelined address. [6]
- (c) How is IMUL different than MUL ? [3]
- 5. (a) What are the differences between dual and quad core CMP ? [3]
  - (b) What is Front Side Bus, Back Side Bus and I/O Bus ?[6]
  - (c) What is single instruction multiple data model for parallel processing ?[4]

- 6. (*a*) Define Chip Multiprocessors (CMP). [3] What are different architectures of multicore ? Explain. [6] (b)What are the advantages of cache memory ? [4](c)7. What are the advantages of Hyper-threading Technology ?[4] (*a*) (b)Draw and explain the block diagram of 64-bit architecture.[6] (*c*) What are the features of Intel Microarchitecture code name Nehalem ? [3] Or
- 8. (a) What are the advantages of virtualization technology ? [4]
  (b) Explain the execution model of SIMD with neat diagram.[6]
  (c) Enlist data types of 64-bit architecture. [3]

 $\mathbf{2}$ 

Total No. of Questions-8]

Seat	
No.	

# [5252]-166

# S.E. (Comp/IT.) (Second Semesters) EXAMINATION, 2017 ENGINEERING MATHEMATICS—III

## (2012 **PATTERN**)

## Time : Two Hours

## Maximum Marks : 50

- N.B. :- (i) Attempt four questions : Q. 1 or Q. 2; Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (*iv*) Use of non-programmable electronic pocket calculator is allowed.
  - (v) Assume suitable data, if necessary.
- 1. (a) Solve any two : (i)  $(D^4 - 1)y = \cosh x \sinh x$ (ii)  $(D^2 - 4D + 4)y = e^{2x} \sec^2 x$  (By variation of parameters) (iii)  $(x+1)^2 \frac{d^2 y}{dx^2} + (x+1) \frac{dy}{dx} = (2x+3)(2x+4)$ (b) Find the Fourier sine integral of : (4)  $f(x) = x^2, \ 0 < x < a$  $= 0, \ x > a$

(a) An electric current consists of an inductance 0.1 henry, a resistance R of 20 ohms and a condenser of capacitance C of 25 microfarads. If the differential equation of electric circuit is :

 $L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = 0$ , then find the charge q and current i at any time t, given that at t = 0, q = 0.05 Coulombs,

$$i = \frac{dq}{dt} = 0$$
 when  $t = 0$ .

(b) Find the Inverse Z-transform (any one) : [4]

(*i*)  $F(z) = \frac{1}{(z-a)^3}$  (By using Inversion Integral Method).

(*ii*) 
$$F(z) = \frac{z^2}{\left(z - \frac{1}{4}\right)\left(z - \frac{1}{5}\right)}, \quad |z| > \frac{1}{4}$$

- (c) Solve the following difference equation to find  $\{f(k)\}$ : [4] f(k + 2) + 3f(k + 1) + 2 f(k) = 0,f(0) = 0, f(1) = 1.
- 3. (a) Calculate the correlation coefficient for the following data : [4]

x	1	2	3	4	5
у	2	5	2	7	6

(b) A firm produces articles of which 0.1% are defective out of 600 articles. If wholesaler purchases 1000 such cases, how many can be expected to have two defectives ? [4]

(c) Find the angle between the surfaces  $xy^2z = 3x + z^2$  and  $3x^2 - y^2 + 2z = 8$  at the point (1, -2, 1). [4]

### Or

- 4. (a) Find the directional derivative of  $xz^3 x^2yz$  at the point (2, 1, -1) in the direction of tangent to the curve  $x = e^t \cos t$ ,  $y = e^t \sin t$ ,  $z = e^t$  at t = 0. [4]
  - (b) If  $\overline{u}$  and  $\overline{v}$  are irrotational vectors, then prove that  $\overline{u} \times \overline{v}$  is solenoidal vector. [4]
  - (c) A random sample of 500 screws is drawn from a population which represents the size of screws. If a sample is distributed normally with a mean 3.15 cm and standard deviation 0.025 cm, find expected number of screws whose size falls between 3.12 cm and 3.2 cm. (Given for z = 1.2, area = 0.3849, z = 2.0, area = 0.4772). [4]
- **5.** (a) Evaluate :

$$\int_{C} \overline{F} \cdot d\overline{r} \quad \text{where} \quad \overline{F} = z\overline{i} + x\overline{j} + y\overline{k} \quad \text{and}$$

C is the arc of the curve  $x = \cos t$ ,  $y = \sin t$ , z = t from t = 0 to  $t = \pi$  [5]

(b) Evaluate  $\iint_{S} (\nabla \times \overline{F}) \cdot d\overline{S}$  for  $\overline{F} = y\overline{i} + z\overline{j} + x\overline{k}$  where S is the

surface of paraboloid  $z = 9 - x^2 - y^2$ ,  $z \ge 0$ . [4]

(c) If 
$$\overline{E} = \nabla \phi$$
 and  $\nabla^2 \phi = -4\pi\rho$ , then prove that  $\iint_{S} \overline{E} \cdot d\overline{S} = -4\pi \iiint_{V} \rho \, dv$ . [4]

6. (a) Using Green's theorem, evaluate :

 $\int_{C} \left(\frac{1}{y} dx + \frac{1}{x} dy\right) \text{ where C is the boundary of the region bounded}$ by the parabola  $y = \sqrt{x}$  and line x = 1 and x = 4. [5]

(b) Use divergence theorem to evaluate

$$\iint_{\mathbf{S}} \left( y^2 z^2 \overline{i} + z^2 x^2 \overline{j} + x^2 y^2 \overline{k} \right) . d\overline{\mathbf{S}}$$

where S is the upper part of the sphere  $x^2 + y^2 + z^2 = 9$  above XOY plane. [4]

(c) Prove that :

$$\int_{C} (\overline{a} \times \overline{r}) \cdot d\overline{r} = 2\overline{a} \cdot \iint_{S} d\overline{S}$$

where S is any open surface with boundary C. [4]

- 7. (a) Determine the analytic function f(z) = u + iv in terms of z. Whose real part is  $e^{2x}(x \cos 2y - y \sin 2y)$ . [5]
  - (b) Using Cauchy's Integral Formula evaluate  $\int_{C} \frac{\cos \pi z}{z^2 1} dz$  where C is the rectangle with vertices  $2 \pm i$ ,  $-2 \pm i$ . [4]
  - (c) Find the bilinear transformation which maps the points
     1, i, -1 from z-plane onto the points i, 0, -i of the W-plane.
     [4]

$$[5252] - 166$$

- Or
- 8. (a) If f(z) = u + iv be an analytic function find f(z). If  $u + v = r^2 (\cos 2\theta + \sin 2\theta)$ . [5]
  - (b) Using residue theorem evaluate : [4]

$$\int_{C} \frac{z^{3}-5}{(z+1)^{2}(z-2)} dz \text{ where } C \text{ is } |z| = \frac{3}{2}.$$

(c) Find the mapping of the line 2y = x under the transformation  $W = \frac{2z-1}{2z+1}.$ [4]

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 $\mathbf{5}$ 

Total No. of Questions-8]

[Total No. of Printed Pages-3

Seat		
No.		

# [5252]-167

# S.E. (Computer) (Second Semester) EXAMINATION, 2017 OBJECT ORIENTED AND MULTICORE PROGRAMMING (2012 PATTERN)

**Time : Two Hours** 

Maximum Marks : 50

- **N.B.** :— (i) Neat diagrams must be drawn wherever necessary.
  - (ii) Figures to the right side indicate full marks.
  - (*iii*) Use of calculator is allowed.
  - (iv) Assume suitable data if necessary.
- 1. (a) Explain the following concepts related to Object Oriented Programming : [6]
  - (1) Array of objects
  - (2) Class as ADTs
  - (b) What are characteristics of friend function ? Write a code to overload ">>" operator using friend function.

## Or

- **2.** (a) What is significance of : [6]
  - (1) Data encapsulation
  - (2) Data abstraction and Information Hiding with reference to Object Oriented Programming ?

Explain with suitable examples : (b)[6] Function prototypes (1)Default and constant arguments. (2)[6] 3. Explain with suitable examples : (a)(1)Virtual destructors (2)Early and Late binding What is importance of : *(b)* [6] Pure Virtual Functions (1)(2)Hybrid Inheritance ?

Or

- 4. (a) What are difference streams operators supported by C++ for Managing Console I/O Operations ? [6]
  - (b) What do you mean by Multicore and Multiprocessors
     Systems? What are challenges of software development with
     these systems ? [6]
- 5. (a) Explain the following : [8]
  - (1) Hardware thread
  - (2) Software thread
  - (3) Hybrid thread
  - (4) User level thread.
  - (b) Describe scheduling and managing policy of thread with respect to multithreading environment [5]

- 6. (a) Explain method of thread creation and joining with suitable code. [8]
  - (b) What do you mean by context switch ? What are similarities and differences between thread and process ? [5]
- (a) What do you mean by race conditions and deadlock ? Explain use of read-write-locks to prevent race conditions and deadlocks. [8]
  - (b) What are different thread strategy approaches that can be used while creating a multithreaded application ? [5]

[13]

## Or

**8.** Write short notes on :

(1) Message Queue

(2) **POSIX Semaphore** 

(3) Relationship between co-operating tasks.

Total No. of Questions—8]

[Total No. of Printed Pages-3

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No.	

# [5252]-168

# S.E. (Computer Engineering) (Second Semester) EXAMINATION, 2017 MICROPROCESSORS AND INTERFACING TECHNIQUES

## (2012 PATTERN)

Time : 2 HoursMaximum Marks : 50

- N.B. :- (i) Answer total question Nos. 1 or 2, 3 or 4, 5 or 6, 7 or 8.
  - (ii) Neat diagrams must be drawn whenever necessary.
  - (*iii*) Figures to the right indicate full marks.

(a) What do you mean by Bus Sizing ? Draw the Memory Read.
 Write cycle timing diagrams for 16 or 32 bit microprocessor.

[8]

 (b) What do you mean by Directive ? Give directive which is related to allocation of storage for one or more values ? (minimum 6 directives) [4]

Or

2. (a) What is DOS ? Explain any two internal and two external DOS commands. [4]

- (b) Compare .COM and .EXE File. [4]
- (c) Explain the concept of TSR with figure. [4]

**3.** (a) Give difference between synchronous and asynchronous communication. [4]

- (b) Draw block diagram for 8251A (VSART) and explain. [5]
- (c) Define sensors and transducer. Give *one* example of each.
  [3]

## Or

- 4. (a) Explain any two operating modes of 8253/8254. [6]
  - (b) Why DMA controlled data transfer are preferred over interrupt driven or program controlled and explain the use of HRQ and EOP signals ?
     [3]
  - (c) What is the difference between n key rollover and 2 key lock out in 8279 ?[3]
- 5. (a) Explain and discuss interface between 8086 and 8087. [6]
  - (b) Draw and explain timing diagram for read operation of 8086 in minimum mode. [7]

## Or

- **6.** (a) Explain the instruction related to 8087: [6]
  - (i) FSTP
  - (ii) FICON
  - (*iii*) FLDZ
  - (*iv*) FIST.
  - (b) Define the following terms : [3]
    - (*i*) Accuracy
    - (*ii*) Monotonocity
    - (*iii*) Offset error.
  - (c) Explain use of 8282 and 8284. [4]

## [5252]-168

 $\mathbf{2}$ 

7. (a)List and explain the features of Intel X58 chipset. [7](*b*) What is the purpose of 82801JR I/O controller Hub ? List of features of same. [4] Draw basic blocks of Intel X58 chipset. [2] (*c*) Or 8. Explain the basic components of i5 processor with block (a)diagram. [7]*(b)* Explain the following components of 82801 JR I/O controller Hub : [6] Direct Media Interface *(i)* Serial peripheral Interface (ii)

(iii) Quiet System Technology.

Total No. of Questions—8]

Seat	
No.	

# [5252]-169

# S.E (Comp.) (Second Semester) EXAMINATION, 2017 COMPUTER GRAPHICS AND GAMING

## (2012 **PATTERN**)

### Time : Two Hours

Maximum Marks : 50

**N.B.** :- All questions are compulsory.

**1.** (a) Explain the following graphics primitives : [6]

- (i) Tablets
- (ii) Light Pen

(b) Explain Bresenham's line drawing algorithm. Using Bresenham's algorithm to draw a line from (1, 1) to (5, 3).
 [6] Or

## **2.** (a) Explain flat panel displays in detail. [6]

(b) What is antialiasing ? How aliasing effect is removed in vector generation algorithm. [6]

**3.** (a) Explain with suitable diagram concave and convex polygons.

[2]

- (b) Explain boundary fill algorithm for polygon. [4]
- (c) Perform a  $45^{\circ}$  rotation of a triangle A(0, 0), B(l, l) and C(5, 2) about the origin. [6]

4.	( <i>a</i> )	Explain Sutherland-Hodgman algorithm for polygon clipping.
		[8]
	( <i>b</i> )	Describe Scaling w.r.t. 2D transformation. [4]
5.	( <i>a</i> )	Explain how binary space partition algorithm be used for
		removal of hidden surfaces. [8]
	( <i>b</i> )	Explain Koch curve in detail giving fractal dimension. [5]
		Or
6.	<i>(a)</i>	Explain Warnock's Algorithm. [7]
	( <i>b</i> )	Write short notes on : [6]
		(i) Ray-tracing
		( <i>ii</i> ) Transparency
7.	( <i>a</i> )	Describe Creation and Deletion operations carried out on the
		segment. [6]
	( <i>b</i> )	Compare conventional and computer based animation techniques.
		[4]
	( <i>c</i> )	What are advantages of CUDA ? [3]
		Or
8.	(a)	Explain link list data structure to represent a display file. [5]

- (b) Write a short note on Animation Languages. [4]
- (c) What is morphing ? Give applications of Morphing. [4]

Total No. of Questions-8]

Seat	
No.	

# [5252]-170

## S.E. (Comp. Engg) (Second Semester) EXAMINATION, 2017 COMPUTER ORGANIZATION (2012 PATTERN)

 Time : Two Hours
 Maximum Marks : 50

 N.B. :- (i)
 Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.

- (ii) Figures to the right indicate full marks.
- (iii) Assume suitable data, if necessary.

1. (a) Explain Booth's multiplication algorithm with suitable example. [6]

(b) List different register set in 80386DX and explain flag register in detail. [6]

Or

- **2.** (a) Explain speedup techniques for the processor in brief. [6]
  - (b) Explain data representation using single and double precision formats. [6]
- **3.** (a) Explain restoring division algorithm with flowchart. [6]
  - (b) Explain in detail hazards in instruction pipeline. What is operand forwarding ? [7]

### Or

- 4. (a) Perform  $1100 \div 11$  using non-restoring algorithm. [6]
  - (b) Compare hardwired control and micro programmed control.
    [7]

<b>5</b> .	(a)	Explain in detail Intel Nehalem Memory Organization.	[6]
	( <i>b</i> )	Explain use of DMA controller in computer system.	[6]
		Or	
6.	<i>(a)</i>	Write a note on memory mapped I/O and I/O mapped	I/O
		with advantages and disadvantages.	[6]
	( <i>b</i> )	Write a note on USB bus organization.	[6]
7.	( <i>a</i> )	Write short note on Sun UltraSparc T1.	[6]
	( <i>b</i> )	Explain in detail IA-64 architecture.	[7]
		Or	
8.	<i>(a)</i>	Compare traditional superscalar architecture and IA	<b>A-6</b> 4
		architecture.	[7]
	( <i>b</i> )	List and explain properties of i5/i7 processor.	[6]

Total No. of Questions—8]

Seat	
No.	

# [5252]-171

Maximum Marks : 50

# S.E. (Infor. Tech.) (First Semester) EXAMINATION, 2017 **DISCRETE STRUCTURE**

## (2012 COURSE)

#### **Time : Two Hours** Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, **N.B.** : (i)

- Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii)Draw neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv)Assume suitable data, if necessary.
- 1. What are different logical connections ? Define all logical (a)connections with the help of proper example. [6]

(b) P.T. 
$$\frac{1}{4} + \frac{1}{4.7} + \frac{1}{7.10} + \dots + \frac{1}{(3n-2)(3n+1)} = \frac{n}{3n+1}$$
 [6]

Or

- 2. A survey of 70 high school students revealed that 35 like folk (a)music, 15 like classical music, and 5 like both. How many of the students surveyed do not like either folk or classical music ? [6]
  - (*b*) What is an equivalent relation ? Identify whether the given relation is an equivalent relation where A =  $\{1, 2, 3, 4\}$ , R =  $\{(1, 1), (1, 2), (2, 1), (2, 2), (2, 3), (2, 3), (2, 3), (3, 3)\}$ (3, 1), (3, 3), (1, 3), (4, 1), (4, 4). Also find the equivalent classes. [6]

- 3. (a) What is monoid ? Show that the algebraic system (A, +) is a monoid, where A is set of integers and + is a binary operation giving addition of two integers. [6]
  - (b) Find the shortest path from a to z, using Dijkstra's Algorithm.



4. (a) Show that the graph G and G<sup>\*</sup> are isomorphic G = (V, E) and G<sup>\*</sup> = (V<sup>\*</sup>, E<sup>\*</sup>) given by : [6] G = ({a, b, c, d}, {(a, b), (a, d), (b, d), (c, d), (c, b), (b, c)}). G<sup>\*</sup> = ({(1, 2, 3, 4}, {(1, 2), (2, 3), (3, 1), (3, 4), (4, 3), (4, 2)}).

- (b) (i) Define Graph Coloring.
  - (ii) User nearest neighbor method to find Hamiltonian circuit starting from a, find its weight. [4]

[2]



5. (a) For the following set of weight, construct the optimal binary prefix tree. For each of the weight in the set, give the corresponding prefix code. [6]

3, 5, 19, 2, 12, 8, 16, 7

(b) Determine the minimum spanning tree using prims algorithm for the following graph : [6]



Or

6. (a) A find maximum flow in the following transport network. [6]



- (b) Represent the following expression as : [6]
  - (1) A binary tree
  - (2) Postfix Notation
  - (3) Prefix Notation.

$$((a + b)*c)/((d - e) ^f)$$

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- 7. (a) How many auto license number plates can be created with 3 alphabets followed by 4 digits if : [4]
  - (1) Repetition of both alphabets and numbers is allowed.
  - (2) Repetition of both alphabets and number is not allowed.
  - (b) In how many ways can five examinations be scheduled in a week so that no two examinations scheduled on same day considering Sunday as holiday ?
     [3]
  - (c) A committee of 5 members is to be formed from a group of 7 men and 6 women. What is the probability that :
    - (1) At least 3 women are part of the committee.
    - (2) All committee members are either men or women. [6] Or
- 8. (a) Out of 15 employees in a software company, a group of 5 employees is to be sent for for 'Linux Administration and Networking' training of one month. [7]
  - (1) In how many ways can the 5 employees be selected ?
  - (2) What if there are 2 employees who refuse to go together for training ?
  - (3) What if there are 2 employees who want to go togetheri.e. either they go together or they do not go for training?
  - (b) Two cards are drawn at random from an ordinary deck of well shuffled 52 cards. Find the probability that : [6]
    - (1) First cards drawn is ace and second cards drawn is face card of spade.
    - (2) Both are spades.

Total No. of Questions-8]

Seat	
No.	

# [5252]-172

# S.E. (I.T.) (First Semester) EXAMINATION, 2017 COMPUTER ORGANIZATION (2012 PATTERN)

## Time : Two Hours

## Maximum Marks : 50

- **N.B.** :— (i) Neat diagrams must be drawn wherever necessary.
  - (ii) Figures to the right indicate full marks.
  - (iii) Assume suitable data, if necessary.
- (a) Draw and explain IEEE double precision floating point format. Represent the number (99.75)<sub>10</sub> using single precision floating point format. [6]
  - (b) Draw and explain the architecture of microprocessor 8086. [7] Or
- (a) List the rules for floating point binary subtraction. Subtract given single precision floating point numbers, where A = 44900000H and B = 42A00000 H. [7]
  - (b) Draw and explain minimum mode timing diagram for I/O read cycle of microprocessor 8086.[6]
- **3.** (a) (i) Draw and explain the flag register of microprocessor 8086. [4]
  - (*ii*) Find out the physical address of an instruction obtained by microprocessor 8086, if CS=A4FBH, IP = 4872H. [2]
  - (b) Draw and explain block diagram of Micro-programmed control unit. [6]

- (a) Explain the following instructions of microprocessor 8086 : [6]
   ADC AL, 05H
   DIV CX
   STD
  - (b) Write control signals generated for execution of an unconditional branch instruction. [6]

[6]

- **5.** (a) Write notes on :
  - RAID
  - EEPROM.
  - (b) Draw address structure of associative mapping and set associative mapping. [6]

Or

- 6. (a) Write features of SRAM cell and compare SRAM with DRAM. [6]
  - (b) Draw and explain two-way set associative cache organization. [6]
- 7. (a) Draw and explain block diagram of programmable peripheral IC-8255.
   [7]
  - (b) Explain Interrupt Driven I/O technique with the help of flowchart. [6]

## Or

8. (a) (i) Write a note on Small Computer System Interface (SCSI) bus. [3]

 $\mathbf{2}$ 

- (*ii*) Compare asynchronous serial communication with synchronous one. [4]
- (b) Explain significance of the following signals of DMA IC-8237: [6]
  - Ready
  - Hold Request (HRQ)
  - Hold Acknowledge (HLDA).

Total No. of Questions—8]

Time : Two Hours

[Total No. of Printed Pages-2]

Seat No.

# [5252]-173

Maximum Marks : 50

# S.E (Information Technology) (I Sem.) EXAMINATION, 2017 DIGITAL ELECTRONICS AND LOGIC DESIGN (2012 COURSE)

*N.B.* :- (*i*) Answer Questions 1 or 2, 3 or 4, 5 or 6 and 7 or 8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (iii) Figures to the right indicate full marks.
- (*iv*) Assume suitable data, if necessary.

1. (a) Explain the following characteristics for TTL logic families :[6]

- (*i*) Propagation delay
- (*ii*) Figure of merit
- (iii) Fan In.
- (b) Design full adder circuit using 4 : 1 Multiplexer. [6]

Or

- (a) Express the following numbers in BCD, Excess-3 and Hexadecimal.
   Show step by step calculations : [6]
  - (*i*) (27)<sub>10</sub>
  - (*ii*) (396)<sub>10</sub>.
  - (b) Design a circuit to find 9's complement of the single digitBCD number using Binary adder IC 7483. [6]
- (a) What is the advantage of MS J-K Flip-Flop ? Explain the working of MS J-K Flip-Flop in detail. [6]

 (b) Draw and explain the Ring Counter with initial state "10011", from initial state explain all possible states in that Ring.[6]
 P.T.O.
- 4. (a) Explain the difference between Combinational and Sequential Circuit. Also convert J-K Flip-Flop to D Flip-Flop. [6]
  - (b) Draw and explain Johnson counter with initial state "1010", from initial state explain all possible states. [6]
- 5. (a) Give the comparison between PROM, PLA and PAL. [6]
  - (b) Design 3-bit Binary to Gray code converter using PLA. [7] Or
- 6. (a) Explain the difference between CPLD and FPGA. [6]
  - (b) Design the following function using PLA : [7] F1 =  $\Sigma m$  (1, 2, 4, 6)  $\Sigma 2 = \Sigma m$  (0, 1, 6, 7) F3 =  $\Sigma m$  (2, 6).
- 7. (a) Write a VHDL code for 4 : 1 Mux using Behavioral Modelling. [6]
  - (b) What is VHDL ? What are the important Features of VHDL ?
     Write Entity and architecture declaration for 2 input AND gate. Assume A and B as input and Z as output of the logic gates.

- 8. (a) What is structural modelling style in VHDL ? Write VHDL code for 2 input EXOR gate with structural modelling. [6]
  - (b) What is the difference between sequential execution and concurrent execution of VHDL statements ? Explain with the help of suitable example.

Seat	
No.	

# [5252]-174

S.E. (Information Technology) (I Semester) EXAMINATION, 2017 FUNDAMENTALS OF DATA STRUCTURES

### (2012 PATTERN)

$NB := (i)$ Answer $O_1$ or $O_2$ $O_3$ or $O_4$ $O_5$ or $O_6$ $O_7$ or $O_1$	8.
( <i>ii</i> ) Neat diagrams must be drawn wherever necessary.	
( <i>iii</i> ) Figures to the right indicate full marks.	
(iv) Assume suitable data if necessary.	
1. (a) What is structure in 'C' ? How do we declare the pointed	er
of structure ?	3]
(b) Explain with suitable example function call by reference and	ıd
function call by value.	4]
(c) Write a pseudo 'C' routine to multiply two matrices.	5]
Or	
<b>2.</b> (a) What is a pointer variable ? Explain declaration, initialization	n
and accessing a pointer variable with an example.	4]
(b) Write and explain any <i>four</i> functions used for fi	le
handling.	4]
(c) Write a pseudo C routine using pointer to add tw	70
matrices.	4]
<b>3.</b> (a) What is frequency count ? What is its importance in analys	is
of algorithm ?	4]
(b) What is Abstract Data Type ? Explain ADT for a	n
array.	4]
P.T.O	Э.

(c) What are Linear and Non-Linear Data Structures ? Explain with example. [4]

Or

- 4. (a) Sort the following numbers using insertion sort. Show all passes : [4]
  60, 15, 80, 50, 40, 01, 07, 20
  (b) Write a pseudo code for binary search without recursion. [4]
  - (c) Explain the time complexity for bubble sort method. [4]
- 5. (a) What is sparse matrix ? What are its applications ? [4]
  - (b) Represent the following polynomials using arrays : (i)  $15x^{3} - 7xy + y^{2} - 50$ (ii)  $y^{4} + 9y + 5$ [4]
  - (c) Explain row major and column major representation of array.[5]

#### Or

- **6.** (*a*) Write a pseudo C algorithm for addition of two sparse matrices.[5]
  - (b) Define stack and queue with example. [4]
  - (c) What is dynamic data structure ? List the advantages of Linked List. [4]

7. (a) Define and explain SLL, DLL & CLL with example. [6]

(b) Write a pseudo code for the addition of a node after the position 'p' in singly linked list. [7]

#### **O**r

8. (a) Explain GLL with suitable example. [6]

(b) Compare Array with Linked List. List the applications of Linked List. [7]

Time : Two Hours

[Total No. of Printed Pages-2]

Seat	
No.	

### [5252]-175

Maximum Marks : 50

## S.E (Information Technology) (I Semester) EXAMINATION, 2017 PROBLEM SOLVING AND OBJECT ORIENTED PROGRAMMING

#### (2012 PATTERN)

N.B. :- (i) Solve Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.

(*ii*) Neat diagram must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

- (*iv*) Assume suitable data, if necessary.
- 1. (a) What is an algorithmic and heuristic solution to a problem ? [6]
  - (b) What is cohesion and coupling ? Why are cohesion and coupling important to programmers ? [6]

#### Or

- 2. (a) Why is it important to maintain a naming convention within the company that is developing computer programs. [6]
  - (b) Create the algorithm and the flowchart to find the percentage result of all the students in a class using Automatic Counter Loop. Write pseudo code for same. [6]
- 3. (a) Write algorithm for Text Line Length Adjustment. [6]
  (b) Explain need of object-oriented programming. [6]

4.	( <i>a</i> )	What are Table lookup techniques ? Explain any one Ta	able
		lookup technique in detail.	[6]
	( <i>b</i> )	Explain the terms : default and constant arguments.	[6]
5.	( <i>a</i> )	Explain need of function overloading. Write C++ program	ı to
		demonstrate use of same.	[6]
	( <i>b</i> )	Explain pure virtual function in detail.	[7]
		Or	
6.	( <i>a</i> )	What is Polymorphism ? What are its types ?	[6]
	( <i>b</i> )	What is inheritance ? Explain types of Inheritance.	[7]
7.	( <i>a</i> )	Write a note on STL.	[6]
	( <i>b</i> )	What is Multiple Exception Handing in C++ ? Give syn	ntax
		of it in C++.	[7]
		Or	
8.	( <i>a</i> )	Explain RTTI in detail.	[6]

(b)	How	to	manage	console	I/O	operations	?	[7	7
$(\mathcal{D})$	110 1	00	manage	CONDUC	I/ U	operations	•	L.	_

Seat	
No.	

### [5252]-176

Maximum Marks : 50

# S.E. (Information Technology) (Second Semester) EXAMINATION, 2017 COMPUTER GRAPHICS

### (2012 PATTERN)

#### Time : Two Hours

N.B. := (i) Answers Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (*iii*) Figures to the right side indicate full marks.
- (iv) Assume suitable data if necessary
- (a) Explain Bresenham's Line algorithm and trace it for the line end points A(0, 0) and B(-8, -4).
   [6]
  - (b) Explain character generation methods. [6]
- (a) List various polygon filling algorithms. Explain scan line algorithm with mathematical formulation. [6]
  - (b) Write a pseudo-C algorithm for polygon filling by Boundary fill and Flood fill recursive method. [6]
- 3. (a) What is a segment ? How do we create it ? Why do we need segments ? Explain in detail the various operations of segments.
   [6]

- (b) Use the Cohen-Sutherland Outcode algorithm to clip two lines.
  P<sub>1</sub>(40, 15), P<sub>2</sub>(75, 45) and P<sub>3</sub>(70, 20), P<sub>4</sub>(100, 10) against a window A(50, 10), B(80, 10), C(80, 40), D(50, 40). [6]
- 4. (a) What is segment table ? Explain window to viewport transformation. [6]
  - (b) What is projection ? Give the various types of projection. State the difference between Parallel and Perspective Projection. [6]
- **5.** (a) Explain RGB, HSV and HLS color models. [7]
  - (b) What is surface rendering ? Explain Gourand method of shading.[6]
- 6. (a) Explain the following terms : Keyframe and Tweening with example. [7]
  - (b) Compare Gourand and Phong method of shading. [6]
- (a) State the various properties of Bezier and B-spline curve.
  [7]
  (b) What is blending function ? Explain interpolation method of
  - curve generation. [6]
- 8. (a) What is true curve generation ? Write a pseudo code to implement DDA arc generation. [7]
  (b) Write short note on Curve generating by using approximation.

[6]

[5252]-176

 $\mathbf{2}$ 

Seat	
No.	

## [5252]-177

Maximum Marks : 50

### S.E. (Information Technology) (Second Semester) EXAMINATION, 2017 PROCESSOR ARCHITECTURE AND INTERFACING (2012 PATTERN)

#### Time : Two Hours

### N.B. :- (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (*iii*) Figures to the right indicate full marks.
- (iv) Assume suitable data if necessary.
- 1. (a) Explain any *four* programming tools needed to write an assembly language program. [8]
  - (b) Draw and explain the function of control register CR0 and CR3 of 80386. [4]

Or

- **2.** (a) What do you mean by assembler directive ? Explain the following assembler directive :
  - (1) DW
  - (2) MACRO
  - (3) EXTRN
  - (4) PUBLIC. [8]
  - (b) Draw the general segment descriptor format. Explain how granularity G bit affects the LIMIT Held. [4]

- 3. (a) Explain page translation process with diagram. Draw PTE and PDE formats. [8]
  - (b) How are interrupts/exception handled in protected mode of 80386 ? Explain using various gates format. [5]

- 4. (a) What is a Task State Segment (TSS) and how docs it support Task Switching ? What is its site and content ? [8]
  - (b) How will you switch from real mode to protected mode and steps needed to set up the Protected mode before switching?
     [5]
- 5. (a) Draw the basic memory structure for 64K program memory and 64k data memory and 4K byte of internal program memory and 256 bytes of internal data memory. [8]
  - (b) Explain the following instructions of 8051 :
    (1) MUL AB
    (2) ADD A,#10h [4]

- 6. (a) Draw internal memory organization of 8051. Explain its distinct advantages and disadvantage. [8]
  - (b) State and justify addressing mode of the following 8051 instruction :
    - (1) MOVX A, @DPTR
    - (2) MOV R6, A. [4]
- (a) List the interrupts support by 8051 with their vector addresses.
   Explain interrupt programming with the help of special function register IE. [7]

(b) Explain special function register SCON and its utility for serial port of 8051 microcontroller. [6]

Or

- 8. (a) Explain the following SFR of 8051 : TMOD and TCON Register. [7]
  - (b) Draw Synchronous and Asynchronous serial communication format. [6]

[Total No. of Printed Pages-4

Seat No.

## [5252] - 178

### S.E. (I.T.)(Second Semester) EXAMINATION, 2017 DATA STRUCTURES AND FILES (2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

- **N.B.** :- (i) Answer four questions.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right side indicate full marks.
  - (iv) Assume suitable data if necessary.
- (a) Clearly indicate the contents of stack during conversion of given infix expression to postfix expression. Consider ^ as exponent operator. [6]

$$A^* (B-C)/E^F+G$$

( <i>b</i> )	Write	а	note	on	priority	queue.	[4]
--------------	-------	---	------	----	----------	--------	-----

(c) Explain the concept of double enced queue. [2]

Or

2. (a) Implement Stack as an ADT using sequential orgnization.[6]

(b) Consider the following Circular Multiqueue of integers and Size 6. [6]



Front of Q1 = -1 Rear of Q1 = -1 Q1 starts at 0 Front of Q2 = -1 Rear of Q2 = -1 Q2 starts at 3 Show the Circular queue conents as per the following operations at every step.

- (i) Insert 21 in Q1
- (ii) Insert 23 in Q1
- (iii) Insert 9 in Q2
- (iv) Insert 8 in Q1
- (v) Insert 10 in Q2
- (vi) Insert 11 in Q2
- (vii) Delete Q1
- (viii) Insert 81 in Q2
- (ix) Delet Q1
- (x) Insert 25 in Q2
- (xi) Insert 100 in Q1
- (xii) Delete Q2
- 3. (a) Write an algorithm for the inorder traversal of a Threaded Binary Tree. [6]
  - (b) Write the pseudo code for Kruskal's algorithm and findMinimum spanning tree for the following graph : [6]



- **4.** (a) Write an algorithm for the evaluation of an expression in the expression tree. [4]
  - (b) Explain with example why infix expression is called unpolished expression ? [2]
  - (c) Write an algorithm for BFS of a graph using adjacency matrix. [6]
- 5. (a) How many binary search trees (BSTs) can be constructed for the given 'n' identifiers ? Construct all possible BSTs for the following identifier set. Compute the cost of each BST. Which BST is an Optimal Binary Search Tree ? [10] The identifier set a[] = (a1,a2,a3) = (do, if, while) with the successful and unsuccessful probabilities.

P[]=(0.5, 0.1, 0.05)

Q[] = (0.15, 0.1, 0.05, 0.05)

- (b) Explain the need of rehashing with example. [4] Or
- 6. (a) Construct an AVL for the following data set [10] 30, 5, 3, 18, 19, 4, 6, 35, 33, 15
  - (b) Huffman Encoding and Decoding. [4]



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Encode : (i) addef (ii) deaf Decode : (i) 0010000111 (ii) 11100101110

7.	<i>(a)</i>	Write the pseudo code for Search and Insert operations	in
		Indexed Sequential File.	[6]
	( <i>b</i> )	Compare Binary file with Text File.	[6]
		Or	
8.	( <i>a</i> )	What is File ? Explain different types of file organization	ns.
			[6]
	( <i>b</i> )	Explain :	[6]
		(i) Primary index	
		(ii) Secondary index	
		( <i>iii</i> ) Cluster index.	

[Total No. of Printed Pages-2

Seat	
No.	

### [5252]-179

### S.E. (Information Technology) (Second Semester) EXAMINATION, 2017 FOUNDATION OF COMPUTER NETWORKS (2012 PATTERN)

#### **Time : Two Hours**

#### Maximum Marks : 50

- N.B. :- (i) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.
- (a) Explain the functions of various components in basic communication system with suitable diagram. [4]
  - (b) Explain Nyquist theorem with suitable example. [4]
  - (c) Explain the Manchester coding with suitable diagram. [4]
- (a) Explain the concept of multiplexing. Explain FDM and TDM techniques ?
   [6]
  - (b) List of various transmission medias. Explain any *two* guided media with help of the diagram. [6]
- **3.** (a) Explain circuit switched network along with its advantages and disadvantages. [6]

	( <i>b</i> )	Draw ISO-OSI Reference model. Explain functions of each lay	yer
		in brief.	[7]
		Or	
4.	( <i>a</i> )	Explain TCP/IP Reference model with help of suitable diagra	m.
			[5]
	( <i>b</i> )	Enlist various connecting devices used in network and expla	ain
		any <i>two</i> in detail.	[4]
	( <i>c</i> )	What is connection oriented and connectionless services ?	[4]
5.	(a)	Explain CRC encoder and decoder with suitable example.	[7]
	( <i>b</i> )	Explain internet checksum method with the help of an examp	ole.
			[6]
		Or	
6.	<i>(a)</i>	Explain stop and wait ARQ technique with suitable diagra	m.
			[7]
	( <i>b</i> )	Explain pure and slotted ALOHA.	[6]
7.	( <i>a</i> )	Explain CSMA/CD technique in detail.	[6]
	( <i>b</i> )	Explain Gigabit Ethernet briefly.	[6]
		Or	
8.	( <i>a</i> )	Explain TDMA and FDMA technique.	[8]
	( <i>b</i> )	Write a short note on HDLC protocol.	[4]

Time : Two Hours

Seat	
No.	

### [5252]-181

### S.E. (Chemical) (First Semester) EXAMINATION, 2017 CHEMISTRY-I

### (2012 PATTERN)

Maximum Marks : 50

- N.B. := (i) Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6Q. 7 or Q. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.
- 1. (a) Give the molecular orbital distribution and deduce the bond order for CO molecule. [6]
  - (b) Derive the integrated rate equation for second order kinetics if initial concentration of reactants are same. Explain the characteristics of second order reaction. [6]
    - Or
- **2.** (a) Give reason :
  - (i) Aniline is a weaker base than aliphatic amines.
  - (ii) Acetic acid is weaker than monochloroacetic acid.
  - (*iii*) Pyridine is a weaker base than pyrrole.
  - (b) (i) Show that time required for first order reaction to complete 99.9% reaction is approximately 10 times its half-life period. [3]
    - (*ii*) Define and explain Stark-Einstein law of photochemical reaction. [3]

P.T.O.

[6]

- 3. (a) Explain the principle, technique and application of column chromatography. [6]
  - (b) Derive the equation for elevation in boiling point and show it is colligative properties. [4]
  - (c) Explain Berkeley and Hartley method for measurement of osmotic pressure. [3]

#### 4. (a) Explain the applications of IR spectroscopy. [6]

- (b) Define and explain Henry's and Raoult's law. [4]
- (c) The lowering of freezing point of xylene was 2.33 K when  $4.12 \times 10^{-4}$  kg of solute of unknown molar mass was dissolved in  $9.31 \times 10^{-3}$  kg of xylene. Calculate the molar mass of solute. (Given K<sub>f</sub> for xylene is 5.1 K kg/mole.) Molecular weight of Naphthalene = 128 gm/mole. [3]
- Give mechanism of Friedel-Craft alkylation and give its merits.
  - (b) Predict the product : [6]
    - $(i) \qquad \operatorname{CH}_3\operatorname{CHI}\operatorname{CH}_3 \xrightarrow{} \begin{array}{c} \operatorname{Base, Polar} \\ \end{array} \xrightarrow{} \\ \begin{array}{c} \operatorname{Solvent} \end{array} \xrightarrow{} \end{array}$
    - $(ii) \quad C_6H_6 \xrightarrow{} Acetic anhydride \rightarrow$



6.	<i>(a)</i>	Write short notes on :	[6]
		(i) Claisen rearrangement	
		( <i>ii</i> ) Nitration of benzene.	
	( <i>b</i> )	What are the effects of the following factors on $S_N^{-1}$ and $S_N^{-1}$	$5_{N}^{2}$
		reactions ?	[6]
		(i) Nature of solvent	
		(ii) Nature of Nucleophile	
		( <i>iii</i> ) Nature of leaving group.	
7.	( <i>a</i> )	Give two methods each for the synthesis of the following :	[6]
		(i) Furan	
		( <i>ii</i> ) Pyrrole.	
	( <i>b</i> )	Give classification of dyes on the basis of application.	[7]
		Or	
8.	<i>(a)</i>	Describe synthesis of the following :	[7]
		(i) Crystal violet	
		(ii) Phenolphthalein.	
	( <i>b</i> )	Write a short note on diazotisation and coupling in azo dyes.	[6]

3

[Total No. of Printed Pages-3

Seat No.

### [5252]-182

### S.E.(Chemical) (I-Semester) EXAMINATION, 2017 CHEMICAL ENGINEERING FLUID MECHANICS (2012 PATTERN)

Time : Two Hours

#### Maximum Marks : 50

- *N.B.* :- (*i*) All questions are compulsory.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right indicate full marks.
  - (iv) Use of programmable calculator is not allowed.
  - (v) Assume suitable data if necessary.
- (a) What are the different time independent rheological behaviours of fluids ? Show the flow curves and give an example of each.
  - (b) An inclined manometer is installed across a pipeline carrying water to measure the pressure drop due to friction. The inclined U tube differential manometer is filled with organic liquid of specific gravity 1.6 and its readings is 5 cm along the inclined limb. The angle between the vertical and inclined limbs is 60°. Calculate the pressure drop. [7]

#### Or

( <i>a</i> )	Discuss the following :	
	(i) Laminar and turbulent flow	
	( <i>ii</i> ) Steady and unsteady flow	
	(iii) Path line and streak line	
( <i>b</i> )	State and explain the Newton's law of viscosity.	[3]
	( <i>a</i> )	<ul> <li>(a) Discuss the following : <ul> <li>(i) Laminar and turbulent flow</li> <li>(ii) Steady and unsteady flow</li> <li>(iii) Path line and streak line</li> </ul> </li> <li>(b) State and explain the Newton's law of viscosity.</li> </ul>

- (c) Two plates are placed at a distance of 0.15 mm apart. The lower plate is fixed while the upper plate having surface area 1.0 m<sup>2</sup> is pulled at 0.3 m/s. Find the force required to maintain this speed, if the fluid separating them is having viscosity 1.5 Poise.
- **3.** (*a*) Write assumptions and correction factors of Bernoulli theorem.[6]
  - (b) A Newtonian fluid having a viscosity of 1.23 poise, and a density of 0.893 gm/cm<sup>3</sup>, is flowing through a straight, circular pipe having an inside diameter of 5 cm. A pitot tube is installed on the pipeline with its impact tube located at the center of the pipe cross-section. At a certain flow rate, the pitot tube indicates a reading of 8 cm of mercury. Determine the volumetric flow rate of the fluid. [6]

- (a) Show that the average velocity of the fluid flowing through a circular pipe under laminar conditions is half that of the maximum velocity.
  - (b) A 25 cm diameter pipe carries oil of sp. Gravity 0.9 at a velocity of 3 m/s. At another section. the diameter is 200 mm. Find the velocity at this section and also mass rate of flow of oil.
- 5. (a) Draw a neat sketch and explain the growth of boundary layer over a flat plate. [6]
  - (b) In a pipe of 300 mm diameter and 800 m length, an oil of specific 0.8 is flowing at the rate of 0.45 m<sup>3</sup>/s. Find :
    - (*i*) Head loss due to friction
    - (ii) Power required to maintain the flow

Take kinematic viscosity of the oil as 0.3 stokes.

[5252]-182

 $\mathbf{2}$ 

- 6. (a) Consider the flow of a Newtonian fluid in a pipe having roughness 'K'. By Reyleigh's method of dimensional analysis, develop an equation relating the frictional pressure drop in terms of the following : [6]
  - $\rho$  density of fluid
  - $\mu$  viscosity of fluid
  - v velocity of fluid
  - D Diameter of pipe
  - L Length of pipe
  - k roughness
  - (b) Define and give equations for the following : [6]
    - (*i*) Displacement thickness
    - (*ii*) Momentum thickness
    - (iii) Energy thickness
- 7. (a) With a neat sketch explain the working of a centrifugal pump. [7]
  - (b) Discuss the classification of the fluidization & describe any one in detail.[6]

- 8. (a) What is drag coefficient ? Show that the drag coefficient is dimensionless. [4]
  - (b) What are different types of Valves ? Explain any one in detail.
  - (c) Draw a neat sketch and show the operating characteristic curves for a centrifugal pump. [3]

Seat No.

### [5252]-184

### S.E (Chemical Engineering) (I Semester) EXAMINATION, 2017 PROCESS CALCULATIONS (2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

- N.B. := (i) Attempt question no.1, or 2, 3 or 4, 5 or 6, 7 or 8.
  - (*ii*) Figures to the right indicate full marks.
  - (iii) Neat diagrams must be drawn wherever necessary.
  - (*iv*) Assume suitable data, if necessary.
  - (v) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.
- (a) A solution of caustic soda contains 20% NaOH by weight. The density of the solution is 1.196 kg/l. Find the Normality, Molarity and Molality of the solution. [6]
  - (b) Soyabean seeds are extracted with hexane in batch extractor. The flaked seeds are found to contain 18.6 % oil, 69% solid and 12.4% moisture (by weight). At the end of the extraction process cake (meal) is separated from hexane-oil mixture. The cake is analysed to contain 0.8% oil, 87.7% solids and 11.5%, moisture (by weight). Find the percentage recovery of oil. [6]

Or

2. (a) When heated to 373K & 95.992 kPa Pressure, 17.2 grams of  $N_2O_4$  gas occupies a volume of 11.45 liters. Assuming that the ideal gas law applies, calculate the perentage dissociation of  $N_2O_4$  to  $NO_2$ . [6]

- (b) The waste acid from nitrating process containing 20%  $HNO_3$ , 55%  $H_2SO_4$  and 25%  $H_2O$  by weight is to be concentrated by addition of concentrated sulfuric acid containing 95%  $H_2SO_4$ and concentrated nitric acid containing 90%  $HNO_3$  to get desired mixed acid containing 26%  $HNO_3$  and 60%  $H_2SO_4$ . Calculate the quantity of waste acid and concentrated acid required for 1000 kg of desired mixed acid. [6]
- 3. (a) The feed containing 60 mole % A. 30 mole % B and 10 mole % inerts enters a reactor. The product stream leaving the reactor is found to contain 2 mole % A. Reaction takes place as.

$$2A + B \longrightarrow C$$

Find the percentage of Original 'A' getting converted to C.

- (b) (i) Calculate the heat of formation of gaseous n-heptane at 298.15 K using following data : [4] Standard heat of formation of  $CO_2$  (g) = -393.51 kJ/mol Standard heat of formation of  $H_2O$  (l) = -285.83 kJ/mol Heat of combustion of  $C_7H_{16}$  (g) at 298.15 K = -4853.43 kJ/mol.
  - (*ii*) Define Heat of Formation & Heat Combustion. [2]

Or

[6]

- **4.** (*a*) Explain :
  - (*i*) Conversion
  - (*ii*) Yield
  - (*iii*) Selectivity
  - (*iv*) Limiting Reactant
  - (v) Excess Reactant
  - (vi) Stoichiometric ratio.

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 $\mathbf{2}$ 

- (b) Define Heat of reaction. In a liquid phase heating system, Diphyl DT (a maxture of diphenyl- diphenyloxide) is used as a thermic fluid. The thermic fluid enters an indirect fired heater at temperature of 453 K (180°C) and leaves the heater at a temperature of 533 K (260°C). Calculate the heat to be supplied in the heater per kg of the liquid heated. Data : The heat capacity of the fluid is given by :
- C =  $1.436 + 2.18 \times 10^{-3}$  T, kJ/(kg.K) where T is in K.[6] 5. (a) 10,000 kg of an aqueous solution containing 29.6% (by weight) anhydrous sodium sulfate at 413K is charged to the crystallizer. During the cooling operation, 5% of the initial water is lost by evaporation & Na<sub>2</sub>SO<sub>4</sub>. 10H<sub>2</sub>O is crystallized out. The mother liquor is found to contain 18.3% (by weight) anhydrous sodium sulfate. Calculate the yield of crystals. [8]
  - (*b*) Define
    - (1) Dry Bulb Temperature
    - (2) Wet Bulb Temperature
    - (3) % Relative Humidity
    - (4) Dew Point
    - (5) Humid Heat

- 6. (a) Carbon dioxide contains 0.053 kmol of water vapour per kmol of dry CO<sub>2</sub> gas at temperature of 308K & pressure of 100 kPa Calculate : [6]
  - (*i*) Relative saturation of the mixture.
  - (*ii*) Percentage saturation of the mixture.
  - (*iii*) The temperature at which the mixture must be heated in order to achieve the relative saturation of 30%.

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[5]

- (b) The dry bulb temperature & dew point of ambient air were found to be 303 K and 289 K respectively. At 100 kPa calculate :[7]
  - (1) The absolute molal humidity
  - (2) The absolute humidity
  - (3) The % RH
  - (4) % saturation
  - (5) The humid heat
  - (6) Humid volume

Data :

Vapour pressure of water at 289K = 1.818 kPa. Vapour pressure of water at 303K = 4.243 kPa.

- 7. (a) Write short note on Orsat Analysis. [4]
  - (b) (1) Explain different types of fuels. [3]
    - (2) A furnace is fired with fuel oil. The Orsat analysis of flue gases by volume is as given below :  $CO_2 = 10.6\%$ ,  $O_2 = 6\%$  and  $N_2 = 83.4\%$  Calculate :
      - (i) The percentage excess air.
      - (*ii*) The C:H ratio in the fuel oil, assuming that does not contain nitrogen. [6]

Or

8. (a) Write short note on proximate analysis and ultimate analysis of coal. [5]

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(b) Crude oil is found to contained 87.1% carbon, 12.5% Hydrogen and 0.4% sulfur (by weight). [4] Its gross calorific value at 298.15 K is measured to be 45070 kJ/kg oil. Calculate its net calorific value at 298.15K. Data :

Latent heat of water vapor at 298.15 K = 2442.5 kJ/kg.

(c) The gross heating value of gaseous n-Propanol is 2067.44 kJ/ mole at 298 K. Calculate its net heating value in KJ/mole at 298 K. (Given : Latent heat of water vapor at 298 K = 2442.5 kJ/kg). [4]

Seat	
No.	

### [5252]-185

# S.E. (Chemical/Printing) (First Semester) EXAMINATION, 2017 ENGINEERING MATHEMATICS-III

### (2012 PATTERN)

### **Time : Two Hours**

#### Maximum Marks : 50

- N.B. := (i) Neat diagrams must be drawn wherever necessary.
  - (ii) Figures to the right indicate full marks.
  - (iii) Use of electronic pocket calculator is allowed.
  - (iv) Assume suitable data, if necessary.

1. (a) Solve any two : [8]  
(i) 
$$(D^2 + 4D + 3)y = e^{-3x}$$
  
(ii)  $(D^2 + 4)y = \sec 2x - by$  variation of parameter.  
(iii)  $\frac{dx}{y} = \frac{dy}{-x} = \frac{dz}{xe^{x^2 + y^2}}$ 

(b) Find the Fourier cosine transform of the function  $e^{-x}$  and hence show that :

$$\int_{0}^{\infty} \frac{\cos mx}{1+x^{2}} dx = \frac{\pi}{2} e^{-m} .$$
[4]
  
*Or*

- 2. (a) A body weighing 4.9 N is hung from a spring. A pull of 10 N will stretch the spring to 5 cm. The body is pulled 6 cm below its equilibrium position and then released. Find the displacement and maximum velocity in t second. [4]
  - (b) Find the function f(x), whose Fourier cosine transform is  $\frac{\sin a\lambda}{\lambda}.$ [4]

(c) Find the Fourier sine transform of the function  $f(x) = e^{-x}$  and hence show that : [4]

$$\int_0^\infty \frac{x\sin mx}{1+x^2} dx = \frac{\pi}{2} e^{-m}$$

3. (a) Find the Laplace transform of any one of the following : [4]  
(i) 
$$\int_{0}^{t} t e^{t} \sin 2t \, dt$$
  
(ii)  $\left[\frac{1-\cos t}{t}\right]$   
(b) Find the inverse Laplace transform of : [4]

$$\log\left[\frac{s+4}{s+8}\right].$$

(c) Find the directional derivative of a scalar point function :  $\phi = xy^2 + yz^3$  at P(1, -1, 1)

in the direction of  $\overline{PQ}$  where  $Q \equiv (3, -2, 3)$ . [4]

4. (a) Prove the following vector identity (any one) : [4]

(i) 
$$\nabla^2(\log r) = \frac{1}{r^2}$$
  
(ii)  $\nabla \cdot \left(r \nabla \frac{2}{r^3}\right) = \frac{6}{r^4}$ .

- (b) Prove that  $\overline{F} = 2xye^{z}i + x^{2}e^{z}j + x^{2}ye^{z}k$  is irrotational vector field. Hence find a scalar potential function  $\phi$  such that  $\overline{F} = \nabla \phi$ . [4]
- (c) Solve the integro differential equation by using Laplace transform method : [4]

$$y(t) + \int_0^t y(t)dt = 1 - e^t \,.$$

5.

Find the work done in moving a particle once round the ellipse (a) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  z = 0 under the field of force : [4]

$$\overline{\mathbf{F}} = \sin y\overline{i} + x(1 + \cos y)\overline{j}$$

$$\iint_{\mathrm{S}} \overline{\mathrm{F}} \, . \, d\overline{s} \, ,$$

given that

$$\overline{\mathbf{F}} = y^2 z^2 \overline{i} + z^2 x^2 \overline{j} + x^2 y^2 \overline{k}$$

and S is the surface bounded by hemisphere  $x^2 + y^2 + z^2$ = 9. [5]

(c)Evaluate :

$$\iint_{\mathbf{S}} (\nabla \times \overline{\mathbf{F}}) \, d\overline{\mathbf{S}} \quad \text{for,}$$

 $\overline{\mathbf{F}} = y\overline{i} + z\overline{j} + x\overline{k}$ , where S is the surface of the paraboloid [4] $z = 1 - x^2 - y^2, z \ge 0.$ Or

If : **6**. (a)

$$\overline{\mathbf{F}} = (2xy + 3z^2)\overline{i} + (x^2 + 4yz)\overline{j} (2y + 6xz)\overline{k},$$

evaluate :

$$\int_{\mathcal{C}} \overline{\mathcal{F}} \, . \, d\overline{r}$$

where C is the curve joining the points (0, 0, 0) to [4] (1, 1, 1).

$$\iint_{\mathbf{S}} (x^3 \overline{i} + y^3 \overline{j} + z^3 \overline{k}) . d\overline{\mathbf{S}}, \qquad [5]$$

where S is the surface of the sphere  $x^2 + y^2 + z^2 = 16$ 3 P.T.O. [5252] - 185

(c) Evaluate :

$$\iint_{\mathbf{S}} (\nabla \times \overline{\mathbf{F}}) . \hat{n} d\mathbf{S}$$

for the surface of the paraboloid  $z = 4 - x^2 - y^2$ ,  $(z \ge 0)$ and  $\overline{F} = y^2 \overline{i} + z \overline{j} + x y \overline{k}$ . [4]

7. (a) A tightly stretched string with fixed end points x = 0 and x = l is initially in a position given by  $y(x, 0) = y_0 \sin^3\left(\frac{\pi x}{l}\right)$ . If it is released from rest from this position, find the displacement y at any distance x from one end at any time t. [7]

$$(b)$$
 Solve :

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}.$$

if

(i) u is finite  $\forall t$ (ii) u = 0 when  $x = 0 \pi \forall t$ (iii)  $u = \pi x - x^2$  when t = 0 and  $0 \le x \le \pi$ . [6] Or

**8.** (a) Solve the equation :

$$\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = 0$$

with conditions

(i) 
$$v = 0$$
 when  $y \rightarrow \infty \forall x$   
(ii)  $v = 0$  when  $x = 0 \forall y$   
(iii)  $v = 0$  when  $x = 1 \forall y$   
(iv)  $v = x(1 - x)$  when  $y = 0$  for  $0 < x < 1$ . [7]

(b) Use Fourier transform to solve the boundary value problem.

$$\frac{\partial u}{\partial t} = \mathbf{K} \frac{\partial^2 u}{\partial x^2} - \infty < x < \infty, t > 0$$
[6]

subject to the following conditions :

(i) 
$$u, \quad \frac{\partial u}{\partial x} \to 0 \text{ as } x \to \pm \infty$$

(*ii*) 
$$u(x, 0) = f(x)$$
.
Total No. of Questions-8]

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# S.E. Chemical (Second Semester) EXAMINATION, 2017

## CHEMISTRY-II

## (2012 **PATTERN**)

# Time : Two Hours

## Maximum Marks : 50

- **N.B.** :— (i) Neat diagrams must be drawn wherever necessary.
  - (ii) Figures to the right indicate full marks.
  - (*iii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (iv) Assume suitable data, if necessary
- **1.** (a) Describe the factors affecting enzyme action. [4]
  - (b) Calculate the EAN of the following complexes : [4]
     (i) [Cr(NH<sub>3</sub>)<sub>6</sub>]<sup>3+</sup>
    - (*ii*)  $[Ni(NH_3)_6]^{2+}$
    - (iii) [Ni(CO)<sub>4</sub>]
    - $(iv) [Cu(CN)_4]^{3-}$
  - (c) What are the important postulates of Werner's theory ?[4]

Or

[4]

- **2.** (a) Predict the product :
  - (*i*)  $H_2NCH_2COOH + NaOH \rightarrow$
  - (*ii*)  $C_6H_{12}O_6 \xrightarrow{HI/\Delta}$
  - (*iii*)  $C_6H_{12}O_6+NH_2OH \rightarrow$
  - (iv)  $C_6H_{12}O_6 + (CH_3CO)_2O \rightarrow$
  - (b) How does the valence bond theory account for the following facts : [4]
    - (i)  $[Ni(CN)_{4}]^{2-}$  is diamagnetic and square planar.
    - (ii) [Ni(CO)<sub>4</sub>]<sup>2-</sup> is diamagnetic and tetrahedral.
  - (c) Explain the primary, secondary and tertiary structures of proteins. [4]
- 3. (a) What is the role of metal oxide catalysts ? Give one example to show the mechanism of metal oxide catalyst. [6]
  - (b) What are precipitation titrations ?
     25 ml of NaCl solution requires 21.8 ml of M/50 AgNO<sub>3</sub> in Mohr's method. Calculate amount of chloride ion per litre of NaCl solution. [6]

### Or

- (a) Give mechanism of metal co-ordination compound catalysed reactions : [6]
  - (*i*) Wacker process
  - (*ii*) Photolysis of water
  - (*iii*) Methanolcarbonylation

### [5252]-186

 $\mathbf{2}$ 

(b) Describe the potentiometric titration curve of Ce<sup>+4</sup>vs Fe<sup>+2</sup>.
 100 ml of 0.1 N Fe<sup>+2</sup> is titrated against 0.1 N Ce<sup>+4</sup> solution from burette. Calculate potential of the redox indicator electrode dipped in the titration mixture when 120 ml burette solution is added.

(c) Explain the Gauche interactions in monosubstituted cyclohexane.

[4]

[4]

### Or

## **6.** (a) Explain the conformation of cyclohexane. [4]

- (b) How will you prepare quinoline from aniline ? [5]
- (c) Give R and S nomenclature for the following compounds : [4]
  - $\begin{array}{ccc} (i) & & & CH_3 \\ & & CI & H \\ & H & CI \\ & & CH_2 \\ & & CH_3 \end{array}$

diastereomers.

 $(ii) \qquad \begin{array}{c} \mathrm{CH}_{3} \\ \mathrm{Cl} & - \mathrm{H} \\ \mathrm{Cl} & - \mathrm{H} \\ \mathrm{Cl} & - \mathrm{H} \\ \mathrm{CH}_{2} \\ \mathrm{CH}_{3} \end{array}$ 

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- 7. Explain the preparation of chloral with the help of flow *(a)* diagram. [7]What are the different types of reactors? [6] *(b)* Orand thermodynamics involved 8. (a)Give the kinetics of sulphonation. [6]
  - (b) Describe the batch process for preparation of nitrobenzene.

[7]

Total No. of Questions-8]

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[6]

Maximum Marks : 50

## S.E. (Chemical) (Second Semester) EXAMINATION, 2017 HEAT TRANSFER (2012 PATTERN)

## **Time : Two Hours**

- **N.B.** :- (i) Your answers will be valued as a whole.
  - (*ii*) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (iii) Assume suitable data, if necessary.

## 1. (a) State and explain :

- (i) Fourier law of heat conduction.
- (*ii*) Newton's law of cooling.
- (iii) Stefan Boltzmann's law of radiation.
- (b) A flat furnace wall is constructed of 114 mm layer of Sil-O-Cel brick, with a thermal conductivity of 0.138 W/(m.K) backed by 229 mm layer of common brick of conductivity 1.38 W/(m.K.). The temperature of inner face of wall is 1033 K (760°C) and that of the outer face is 349 K. (76°C)
  - (a) What is heat loss through the wall.
  - (b) Supposing that the contact between two brick layers is poor and that a contact resistance of 0.09 k/W is present what would be the heat loss ?[6]

- 2. (a) Derive an expression for steady state rate of heat flow through composite cylinder. [6]
  - (b) Define the following :
    - (i) Critical thickness of Insulation
    - (ii) Heat transfer coefficient
    - (*iii*) Thermal conductivity.

P.T.O.

[6]

- **3.** (a) Compare between filmwise and Dropwise condensation. [3]
  - (b) Write short note on any one :
    - (i) Thermal Boundary Layer;
    - (*ii*) Significance of Prandtl Number. [3]

[6]

[4]

(c) Two parallel planes with emissivities 0.4 and 0.9 exchange the heat. Estimate the percent reduction in heat transfer when a polished aluminium radiation shield with emissivity of 0.05 is placed between them.

#### Or

- 4. (a) Explain any two :
  - (i) Gray Body
  - (ii) Wien's displacement law
  - (*iii*) Radiation shield.
  - (b) Calculate the rate of heat loss from a thermoflask, if the polished silvered surfaces have emissivities of 0.05, the liquid in the flask is at 368 K (95°C) and the casing is at 293°K (20°C). Calculate the loss if both surfaces were black. [6]
- **5.** (a) Define effectiveness and capacity Ratio of Heat Exchanger. [5]
  - (b) Describe heat transfer in agitated vessels.
  - (c) Write a short note on the Log Mean Temperature difference (LMTD). [4]

### Or

- 6. (a) A shell and tube heat exchanger is to be provided with tubes of 31 mm od, 27 mm id 4 m long. It is required for heating water from 295 K (22°C) to 318 K (45°C) with help of condensing steam at 393 K (120°C) on the outside of tubes. Determine the number of tubes required of water flow rate is 10 kg/s. Heat transfer coefficient on steam side and water side are 6000 W/m<sup>2</sup>K and 850 W/m<sup>2</sup>K resp. Neglect all other resistances. [8]
  - (b) What is Fouling factor ? Explain. [5]

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 $\mathbf{2}$ 

7. (a) Write material and enthalpy balances for single effect evaporator. [7]

[6]

- (b) Define the following :
  - (*i*) Boiling point elevation
  - (*ii*) Capacity
  - (iii) Steam economy of the evaporator.

### Or

- 8. (a) Explain construction of long tube vertical evaporator with neat sketch. [5]
  - (b) A triple effect evaporator is concentrating a solution that has no appreciable boiling point elevation. The temperature of steam to the first effect is 381.3 K and boiling point of solution in the last effect is 324.7. The overall heat transfer coefficients in first second and third effect are 2800, 2200 all 1100 W/m<sup>2</sup>K respetively. At what temperature will the solution boil in the first and second effects ? [8]

Total No. of Questions-8]

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No.	

# [5252]-188

# S.E. (Chemical) (Second Semester) EXAMINATION, 2017 PRINCIPLES OF DESIGN

### (2012 **PATTERN**)

### **Time : Two Hours**

## Maximum Marks : 50

- **N.B.** :- (i) Neat diagrams must be drawn wherever necessary.
  - (ii) Figures to the right indicate full marks.
  - (iii) Assume suitable data, if necessary.
  - (*iv*) Use of calculator is allowed.
- (a) What is the difference between the process design and mechanical design. [6]
  - (b) A cantilever beam AB of length 2 m is fixed at end A. It carries udl of 2 kN/m over entire length and downward point load 1 kN at free end B.
     [7]
    - I. Calculate reactive force and moment at fixed end A.
    - II. Sketch shear force and bending moment diagrams.
    - III. Find maximum sagging and hogging bending point.
    - IV. Locate point of contraflexure if any

### Or

(a) What is meant by stress concentration ? How do you take it into consideration in case of component subjected to dynamic loading ?

- (b) A metal rod of 16 mm diameter is fractured at a tensile force of 90 kN. Another hollow circular rod of 25 mm inside diameter of same metal has to withstand a tensile force of 40 kN. Adopting a factor of safety 3, determine the required wall thickness.
- 3.

(a)

- Discuss the function of coupling. Give at least three practical applications. [6]
- (b) A shaft rotating at a constant speed is subjected to variable load. The bearing support the shaft are subjected to stationary equivalent radial load of 3 KN for 10% of time, 0.2 KN for 20% of time, 1 KN for 30% of time and no load for remaining time of cycle. If the total life expected for the bearing is 20×10<sup>6</sup> revolutions at 95% reliability. Calculate dynamic load rating of the ball bearing. [6]

Or

- 4. (a) An automobile transmission shaft is required to transfer 45 kW at 500 rpm. The outside diameter must not exceed 50 mm and the maximum shear stress is not to exceed 84 MPa. Compare the weights of solid and hollow shafts which would just meet these requirements. Also find percentage saving in material if any. [7]
  - (b) Calculate the force required to punch a circular blank of 60 mm diameter in a plate of 5 mm thick. The ultimate shear stress of the plate is 350 N/mm<sup>2</sup>. [5]

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 $\mathbf{2}$ 

- 5. (a) What are various types of welding joints used in pressure vessels ? Discuss with neat sketch. [6]
  - (b) A thick walled high pressure vessel has 500 mm inside diameter. It is subjected to an internal pressure of 6000 bar, the yield strength of material is 5000 kg/cm<sup>2</sup>. Ultimate tensile strength of material is 6500 kg/cm<sup>2</sup>. Calculate the thickness of vessel according to the various theories of failure. Factor of safety is 1.4.

Also estimate the tangential stress and radial stress variation along the vessel wall. [6]

Or

- 6. (a) Explain with a neat sketch various types of flanged joints used in pressure vessels. [6]
  - (b) A vessel having 1.6 m outside diameter is to operate at a pressure of 5 kg/cm<sup>2</sup>. The permissible stress of the material used for fabrication 1020 kg/cm<sup>2</sup>. Welded joint efficiency is 85%. Calculate the thickness required for a cylindrical vessel and a spherical vessel ? Which vessel should be selected for operation. Design pressure =  $5 \times 1.1 = 5.5$  kg/cm<sup>2</sup>? [6]
- 7. (a) Calculate the thickness of a flanged torispherical head for a vessel having internal diameter 6000 mm. Design pressure of the vessel is 3.4 kg/cm<sup>2</sup>. Inside crown radius is 6000 mm. Inside knuckle radius is 380 mm, permissible stress of the material is 1190 kg/cm<sup>2</sup>, welded joint efficiency is 100%. [7]

(b) Which joint in a vessel is stronger, circumferential or longitudinal ? How can the wak join be reinforced ? What are the advantages of such reinforcement ? [6]

Or

- 8. (a) Write distinguishing points between a thick and thin cylinder. [6]
  - (b) A vessel is designed for an internal pressure 100 kg/cm<sup>2</sup>. A spiral would metal fibre stainless steel gasket with inside diameter 36 cm and width 2 cm is used. Gasket factor is 3.0 while gasket seating stress is 675 kg/cm<sup>2</sup>. Permissible stress for bolt material at atmospheric and operating condition is 1300 kg/cm<sup>2</sup>. Check whether the gasket width is sufficient to keep it away from crushing out ? [7]

Total No. of Questions-8]

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No.	

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# S.E. (Chemical) (Second Semester) EXAMINATION, 2017 MECHANICAL OPERATIONS (2012 PATTERN)

### **Time : Two Hours**

### Maximum Marks : 50

- N.B. :- (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3. or Q. No. 4, Q. No. 5 or Q. No. 6 and Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.
- 1. (a) Explain Cyclone Separator with neat diagram. [6]
  - (b) Give the details about the variables in screening operation.

[6]

### Or

2. (a) A material is crushed in a Blake jaw crusher and the average size of particles is reduced from 5 cm to 1.3 cm, with consumption of 37 (watts) (hour)/ (metric ton). What will be the consumption of energy necessary to crush the same material of average size 8 cm to an average size of 3 cm ? You may assume that the mechanical efficiency remains unchanged. Do the calculations using :

(i) Rittinger's Law,

- (b) Comparison between Crushing and Grinding operations. [4]
- 3. (a) What are the types of screening equipments ? Explain any one with neat diagram. [6]
  - (b) Describe with neat sketch construction of screw conveyor. List advantages and disadvantages. [6]

### Or

- 4. (a) Describe characteristics of Impellers. [6]
  - (b) What is Mixing ? Explain the necessity of mixing in chemical industries.[6]
- 5. (a) A rotary filter operating at 2 rpm, filters 1000 lit./min operating under the same vacuum neglecting the resistances of the filter cloth at what speed must the filter be operated to give filtration rate of 2000 lit/min. [8]
  - (b) Comparison of sedimentation and centrifugation with respect to product. [5]

### Or

- 6. (a) What are the various factors which affect the rate of filtration?Derive an expression to calculate the rate of filtration. [9]
  - (b) Explain the principle of centrifugal filtration. [4]

### [5252]-190

 $\mathbf{2}$ 

7. (a) Describe in brief electroflotation plant with neat diagram. [9]

- (b) Write short notes on the following [4]
  - (i) Hydrocyclone
  - (ii) Solid bowl centrifuge

## Or

- 8. (a) Write an explanatory note on Kych Theory of sedimentation. [9]
  - (b) Explain mechanism of sedimentation and classify equipments used for Sedimentation. [4]

Total No. of Questions—8]

**Time : Two Hours** 

Seat	
No.	

# [5252]-501

Maximum Marks : 50

# S.E. (Civil Engineering) (First Semester) EXAMINATION, 2017 BUILDING TECHNOLOGY AND MATERIALS

### (2015 **PATTERN**)

# N.B. :- (i) Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.

- (ii) Figures to the right indicate full marks.
- (iii) Draw neat sketch wherever necessary.
- (a) Enlist different shallow and deep foundations and describe one in each category. [6]
  - (b) Write a short note on composite masonry with explanatory sketch. [6]

### Or

- 2. (a) Explain the following terms : Bond, Through stone, Stretcher. [6]
  - (b) Explain in depth : Slip form work. [6]
- 3. (a) Give the detailed process of tile flooring. [6]
  (b) Draw a sketch of "Casement Window" indicating all the terms. [6]

Or

**4.** (a) Write a short note on space frames. [6]

- (b) Explain the following terms (by drawing a sketch inclusive of all) :
  - abutment. voussoirs, extrados. [6]
- 5. (a) Design a dog legged stair for commercial building with 3.3 m height with riser height of 0.15 m and tread width 0.3 m with flight width of 1.5 m. Draw a neat sketch for the same.
  - (b) Explain in depth the purpose of protective coatings. [6] Or
- 6. (a) Write a note on "applicability of lifts and escalators". [6]
  (b) Explain the term Pointing and its applications by drawing minimum 3 types. [7]
- 7. (a) Why and where aluminum products are used ? [6]
  - (b) Explain in depth the term shoring with explanatory sketch (any one category) : Shoring. [7]

Or

- 8. (a) Why ecofriendly materials are important ? Explain by giving appropriate examples. [6]
  - (b) What precautions are to be taken while storing the materials on site ? Explain by giving appropriate examples. [7]

[5252]-501

 $\mathbf{2}$ 

Total No. of Questions-8]

Seat	
No.	

# [5252]-502

# S.E. (Civil) (First Semester) EXAMINATION, 2017 STRENGTH OF MATERIALS

## (2015 PATTERN)

### Time : Two Hours

## Maximum Marks : 50

- **N.B.** :- (i) Neat Diagrams should be drawn wherever necessary.
  - (*ii*) Figures to the right indicate full marks.
  - (iii) Use of electronic pocket calculator is allowed.
  - (*iv*) Assume suitable data if necessary.
  - (v) Solve 4 questions, Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or
    Q. 6, Q. 7 or Q 8.
- (a) Determine the maximum weight W that can be supported by two wires as shown in Fig. 1, if the stress in each wires is 120 N/mm<sup>2</sup>.



Fig. 1

(b) A beam of hollow rectangular section is subjected to a maximum shear force of 50kN. Find the maximum shear stress. Also draw the shear stress distribution across the section. Refer
 Fis. 1.2. [6]





2. (a) A circular rod ABC is subjected to axial compressive load of 50 kN, the part AB is hollow circular with external diameter 25 mm & internal diameter of 10 mm & length of 200 mm. The part BC is solid circular with diameter of 25 mm & length 300 mm. Calculate total decrease in length of bar. Take E = 200 kN/mm<sup>2</sup>: [6]



Fig. 3

(b) The tension flange of cast iron I-Section beam is 240 mm wide & 50 mm deep. The compression flange is 100 mm wide & 20 mm deep whereas web is 300 mm × 30 mm. Find the load per m run which can be carried over a 4 m span by a simply supported beam. If maximum permissible stresses is 24 MPa. (Fig.4)



Fig. 4

- 3. (a) A hollow steel shaft transmits 200 kW of power at 180 rpm. The total angle of twist in a length of 5 m of the shaft is 3°. Find the inner & outer diameter of the shaft if permissible shear is 60 MPa. Take G = 80GPa. [6]
  - (b) The stresses at a point in a component are 100 MPa(T) & 50 MPa(C). Determine the magnitude of the normal & shear stresses on a plane inclined at an angle of 25° with tensile stress. Also determine magnitude of the maximum intensity of shear stress.

Or

- 4. (a) (i) Write the assumption for finding out the shear stress in a circular shaft subjected to torsion. [3]
  - (*ii*) The circular shaft of 30 mm diameter is running at 85 rpm. If the shear stress is not to exceed 35 MPa. Find the power which can be transmitted by the shaft. [3]
  - (b) A bar 10 mm in diameter gets stretched by 0.3 mm under a gradually applied load of 800N. What stress will be induced in the same bar if the same load falls from 80 mm on a collar attached at the lower end of the bar ? Take E = 200 GPa. [6]
- (a) A simply supported beam loaded & supported as shown in figure. Draw SFD & BMD. Calculate maximum value of bending moment. (Fig. 5).





(b) The diagram shown in figure is the shear force diagram for a beam which rests on two supports. No couple is acting on a beam. Draw BMD & load diagram (Figure 6). [7]



6. (a) Draw SFD & BMD for the simply supported beam as shown in fig. 7 [6]



Fig. 7

(b) The beam AD Simply supported at ends is having SFD as shown in fig. 8 Draw loading diagram. Hence plot BMD. [7]



Fig. 8

- (a) State the assumption made in Euler's theory & derive the expression for critical load for a column pinned at both its end.
  - (b) Compare the crippling loads given by Euler's & Rankine's formulae for a tabular steel strut 2.5 m long having outer & inner diameter as 40 mm & 30 mm respectively loaded through pin jointed at the ends. Take vield stress as 320 N/mm<sup>2</sup>, the Rankine's

 $\mathbf{5}$ 

constant 
$$=\frac{1}{7500}$$
 & E = 2 × 10<sup>5</sup> N/mm<sup>2</sup>. [7]

### [5252]-502

- 8. (a) A rectangular of width 140 mm & of thickness 120 mm carries a point load of 180 kN at an eccentricity of 10 mm. Determine the maximum & minimum stress at the base of column. [6]
  - (b) An aluminum tube of length 8 m is used as a simply supported column with two ends hinged carrying 1.4 kN axial loads. If outer diameter is 50 mm. Compute the inner one that would provide factor of safety 2 against buckling. Use E = 70 GPa for aluminum.

Total No. of Questions—8]

[Total No. of Printed Pages-3

Seat No.

# [5252]-503

## S.E (Civil) (I Sem.) EXAMINATION, 2017 GEOTECHNICAL ENGINEERING (2015 PATTERN)

 Time : Two Hours
 Maximum Marks : 50

 N.B. :-- (i)
 Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.

- (ii) Neat diagram must be drawn wherever necessary.
- (*iii*) Figures to the right side indicate full marks.
- (*iv*) Use of Calculator is allowed.
- (*iv*) Assume suitable data if necessary.
- 1. (a) What are the major soil deposits of India ? Explain any two in brief. [6]
  - (b) State how field permeability is determined. Explain any one method.

### Or

- 2. (a) Define shrinkage limit. A shrinkage limit test gave the following observations. Determine the shrinkage limit. Volume of dry pat = 29.30 ml, Mass of dry pat = 48.32 gm, Initial volume (wet) = 43.50 ml, Initial mass (wet) = 66.66 gm, Find the shrinkage limit.
  - (b) Explain flow net construction for seepage below earthen dam.[6]
- **3.** (a) What are the advantages of triaxial compression test in comparison with the direct Shear test ? [6]
  - (b) Write a short note on "Proctor needle in field compaction control." [6]

- 4. (a) Define sensitivity and thixotropy. [7] A cohesive soil has an angle of shearing resistance of  $15^{\circ}$  & cohesion of 35 kN/m<sup>2</sup>. If a specimen of this soil is subjected to a triaxial compression test, find the value of lateral pressure in the cell for failure to occur at a total axial stress of  $300 \text{ kN/m}^2$ .
  - (b) Write the equations for stresses in soil for point loading by Boussinesq's and Westergaard's theory and assumptions in these theories.
     [6]
- 5. (a) Explain Coulomb's Wedge theory for determination of earth pressure. [6]
  - (b) A vertical retaining wall retains the level backfill of sand. The water level stands  $H_1$  metres below the top of the backfill. Draw the pressure distribution diagram for the active conditions.[6]

#### Or

- 6. (a) State the assumptions made in Rankine's Earth Pressure theory and derive the relation for earth pressure at rest condition.[6]
  - (b) Explain active state of earth pressure condition. A wall 6 m high has a smooth vertical back and it retains a non-cohesive level backfill with  $\gamma = 18.0 \text{ kN/m}^3$ ,  $\phi = 30^{\circ}$ . Determine the total lateral pressure in active state. [6]
- 7. (a) What is Stabilization-solidification ? How is chemical decontamination carried out ? [6]
  - (b) What is infinite and Finite slopes ? Give examples.
     Explain how the stability charts are used in the design of slopes.

- 8. (a) Derive the critical height of slope for a verical excavation in a c- $\Phi$  soil. What is the critical height of vertical excavation that can be made without any lateral support in a cohesive soil having the following properties-  $\gamma = 18$  kN/m<sup>3</sup>, c = 14 kN/m<sup>2</sup>,  $\Phi = 12^{\circ}$ . [6]
  - (b) Write a short note on subsurface contamination and contaminant transport. [7]

Total No. of Questions—8]

Seat	
No.	

# [5252]-504

## S.E. Civil (I Semester) EXAMINATION, 2017 SURVEYING

## (2015 COURSE)

### **Time : Two Hours**

Maximum Marks : 50

**N.B.** :- (i) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (iii) Figures to the right indicate full marks.
- (iv) Assume suitable data if necessary.
- (v) Use of electronic pocket culculator is allowed in the examination.
- (vi) Use of cell phone is prohibited in the examination hall.
- 1. (a) Explain the following with neat sketches :
  - (1) Quadrantal bearing
  - (2) Orientation by back sighting
  - (b) The following records refers to an operation involving reciprocal leveling :

Instrument	Staff reading on		Remarks
At	А	В	
А	2.255	3.795	Distance $AB = 200.00 m$ .
В	1.005	2.705	RL of A = $500.500$ m.

Find:-(1) The true reduced level of B.

- (2) The combined correction for curvature and refraction.
- (3) The collimation error.
- (4) Whether the line of collimation is inclined upward or downward. [6]

P.T.O.

[6]

Or

(a) The following fore and back bearings were observed in traversing with a compass in place where Local Attraction was suspected. Find the corrected FB and BB of lines. Also calculate included angles.

Line	PQ	QR	RS	SP
FB	124°30'	68°15'	310°30'	200°15'
BB	304°30'	246°00'	135°15'	17°45'

- (b) Explain the following with neat sketches :
  - (1) Longitudinal Levelling
  - (2) Axis of Level Tube
  - (3) Contour Interval
- **3.** (a) Explain the following technical terms :
  - (1) Face Left
  - (2) Swinging Right
  - (3) Departure
  - (b) The following observations were made on vartically held staff with a Tachometer fitted with an anallactic lens. Find the level difference between P and Q.
     [6]

Instrument	Staff	Vertical	Hair readings	Remarks
station	station	angle	(m)	
0	Р	+5°00'	$0.850, \ 1.30, \ 1.50$	R.L. of
	Q	+10°00'	$0.70, \ 0.95, \ 1.15$	point P is
				200 m

Or

- 4. (a) Explain the following technical terms with sketch if necessary :
  - (1) Tacheometry

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[6]

[6]

- (2) Stadia diaphragm
- (3) Additive constant
- (b) The following are the length and bearings of the sides of a traverse ABCD. Compute the length and bearing of the line DA.
   [6]

[6]

Line	Length (m)	Bearing
AB	485	341°15'
BC	1725	16°30'
CD	1050	142°00'

**5.** (a) Define Curve. Explain various elements of curves. [7]

(b) Two straights AB and BC intersect at a chainage of 2550 m. The angle of intersection is 120°. It is required to set out a 5° simple circular curve to connect the straights. Calculate all data necessary to set out the curve by the method of offsets from the chord produced with an interval of 30 m. [6]

### Or

- 6. (a) Classify the different types of curves. Explain the method of setting curve by offset from chord produced. [7]
  - (b) Two straights AB and BC intersect at a chainage of 2550 m. The angle of deflection is 50°. It is required to set out a 5° simple circular curve to connect the straights. Calculate all data necessary to set out the curve by the method of offsets from the chord produced with an interval of 30 M. [6]
- 7. (a) Explain with sketch the significance of horizontal and vertical control in building construction. [7]
  - (b) Write a short note on GAGAN with any *four* points and a sketch. [6]

### Or

8. (a) Describe the procedure of setting out drainage line with sketch.[7]
(b) Explain the salient features of GLONASS. [6]

Total No. of Questions-8]

Seat	
No.	

# [5252]-505

[8]

## S.E. (Civil) (First Semester) EXAMINATION, 2017 **ENGINEERING MATHEMATICS—III** (2015 **PATTERN**)

Time : Two	Hours	Maximum	Marks :	50
<b>N.B.</b> : ( <i>i</i> )	Attempt Q. No. 1 or Q. No. 2,	Q. No. 3	or Q. No.	4,
	Q. No. 5 or Q. No. 6 and Q.	No. 7 or	Q. No. 8.	

- (ii)Figures to the right indicate full marks.
- (*iii*) Neat diagrams must be drawn wherever necessary.
- Use of electronic pocket calculator is allowed. (iv)
- Assume suitable data, if necessary. (v)

- $(D^3 D^2 + 4D 4)y = e^x$ . (i)
- $(D^2 + 4)y = \sec 2x.$ (ii)

(by method of variation of parameters)

(*iii*) 
$$x^3 \frac{d^3 y}{dx^3} + x^2 \frac{d^2 y}{dx^2} - 2y = \frac{1}{x^3}$$
.

*(b)* Solve the following equations by using Gauss elimination method : [4]

$$2x_{1} + 4x_{2} + x_{3} = 3$$
  

$$3x_{1} + 2x_{2} - 2x_{3} = -2$$
  

$$x_{1} - x_{2} + x_{3} = 6$$
  
*Or*

2. A light horizontal strut AB of length l is freely pinned at (a)A and B and is under the action of equal and opposite P.T.O. compressive forces P at each of its ends and carries a load W at its centre. How that the deflection at its centre is :

$$\frac{W}{2P} \left[ \frac{1}{n} \tan \frac{nl}{2} - \frac{l}{2} \right]$$
  
where  $n^2 = \frac{P}{EI}$ . [4]

(b) Use Runge-Kutta method of fourth order to obtain y when x = 1.1 for [4]

$$\frac{dy}{dx} = x^2 + y^2;$$
  
y(1) = 1.5, h = 0.1

$$4x_{1} + 2x_{2} + 14x_{3} = 14$$
  

$$2x_{1} + 17x_{2} - 5x_{3} = -101$$
  

$$14x_{1} - 5x_{2} + 83x_{3} = 155$$
[4]

**3.** (a) Calculate first three moments of the following distribution about the mean : [4]

x	f
0	1
1	8
2	28
3	56
4	70
5	56
6	28
7	8
8	1

- (b) If mean and variance of a binomial distribution are 12 and 3 respectively, find  $P(r \ge 1)$ . [4]
- (c) Find the directional derivative of  $\phi = x^2 y^2 2z^2$  at the point P(2, -1, 3) in the direction PQ where Q(5, 6, 4).[4] Or
- 4. (a) Prove the following (any one) :
  - (i)  $\nabla . (r^3 \overline{r}) = 3r(r^2 + 1)$

$$(ii) \qquad \nabla^2 \left[ \nabla . (r^{-2}\overline{r}) \right] = 2r^{-4}$$

(b) Prove that :

$$\overline{\mathbf{F}} = \frac{1}{r} [r^2 \overline{a} + (\overline{a} \cdot \overline{r})\overline{r}]$$

is irrotational.

(c) Obtain correlation coefficient between population density and death rate from the data related to 5 cities. [4]

Population	density	Death rate
200		12
500		18
400		16
700		21
300		10

5. (a) Evaluate 
$$\int_{C} \overline{F} \cdot d\overline{r}$$
 where  $\overline{F} = (x^2 + y^2)\hat{i} + (x^2 - y^2)\hat{j}$  and C is the curve  $y = x^2$  joining (0, 0) and (1, 1). [5]

[5252]-505

3

P.T.O.

[4]

[4]

- (b) Using Gauss divergence theorem, for the vector function  $\overline{F} = (x^3 - yz)i - 2x^2y\hat{j} + 2\hat{k}$  evaluate  $\iint_{S} \overline{F} \cdot d\overline{S}$ , where S is the surface bounding. The cube x = 0, y = 0, z = 0 and x = a, y = a and z = a. [4]
- (c) Evaluate using Stokes' theorem  $\int_{C} \overline{F} \cdot d\overline{r}$ , where  $\overline{F} = yz\hat{i} + zx\hat{j} + xy\hat{k}$ and C is the curve  $x^{2} + y^{2} = 1$ ,  $z = y^{2}$ . [4]
- 6. (a) Show that  $\overline{F} = (2xy + z^3)\hat{i} + x^2\hat{j} + 3xz^2\hat{k}$  is a conservative force field. Find the work done by the force  $\overline{F}$  in moving the object from (1, -2, 1) to (3, 1, 4). [5]

(b) Evaluate using Stokes' theorem  $\iint_{\mathbf{S}} \nabla \times \overline{\mathbf{F}} \cdot d\overline{\mathbf{S}}$ , where

 $\overline{F} = (2x - y)\hat{i} - yz^2\hat{j} - y^2z\hat{k}$ , where S is the upper half surface of the sphere  $x^2 + y^2 + z^2 = 1$  and  $z \ge 0$ . [4]

(c) Evaluate  $\iint_{S} \overline{r} \cdot \hat{n} \, dS$  over the surface of a sphere of radius 2 with origin as centre. [4]

7. (a) Solve  $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$  subject to the following conditions : [7] (i)  $y(0, t) = 0, \forall t$ (ii)  $y(l, t) = 0, \forall t$ (iii)  $\left(\frac{\partial y}{\partial t}\right)_{t=0} = 0$ 

$$(iv) \quad y(x, 0) = \frac{3a}{2l}x, 0 < x < \frac{2l}{3}$$
$$= \frac{3a}{l}(l-x), \frac{2l}{3} < x < l.$$

- (b) An infinitely long plane uniform plate is bounded by two parallel edges in the y-direction and an end at right angles to them. The breadth of the plate is  $\pi$ . This end is maintained at the constant temperature 40°C at all points and other edges at zero temperature. Find the steady state temperature u(x, y). [6]
  - Or

8. (a) Solve 
$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$
 subject to the following conditions : [7]  
(i)  $u$  is finite for all  $t$   
(ii)  $u(0, t) = 0, \forall t$   
(iii)  $u(l, t) = 0, \forall t$   
(iv)  $u(x, 0) = \pi x - x^2, 0 \le x \le \pi$ .  
(b) Solve the wave equation : [6]

$$\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2}$$

subject to the following conditions :

(i) 
$$u(0, t) = 0, \forall t$$
  
(ii)  $u(\pi, t) = 0, \forall t$   
(iii)  $\left(\frac{\partial u}{\partial t}\right)_{t=0} = 0$   
(iv)  $u(x, 0) = 2x, 0 < x < \pi$ .

Total No. of Questions—12]

Seat	
No.	

# [5252]-506

# S.E. (Civil Engineering) (Second Semester) EXAMINATION, 2017 FLUID MECHANICS—I

## (2015 **PATTERN**)

Time : Two Hours

## Maximum Marks : 50

- N.B. :- (i) Answer any six questions from Q. No. 1 or 2, Q. No.
  3 or 4, Q. No. 5 or 6, Q. No. 7 or 8, Q. No. 9 or 10,
  Q. No. 11 or 12.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right side indicate full marks.
  - (*iv*) Use of calculator is allowed.
  - (v) Assume suitable data, if necessary

## **1.** (a) Write a short note on vapour pressure. [2]

(b) Define Newtonian and non-Newtonian fluids and give twoexamples of each. [3]

Or

- **2.** (a) Define the following properties and state their units : [3]
  - (i) Bulk modulus of elasticity
  - (ii) Specific weight
  - (*iii*) Surface tension.
  - (b) State and explain Newton's law of viscosity. [2]

3.	( <i>a</i> )	Explain	the	three	states	of eq	uilibrium	of a	floating	body	with
		referenc	e to	its	metace	ntric	height.				[3]

(b) Define Buoyancy, centre of Buoyancy. [2]

### Or

- 4. (a) State and explain Pascal's law. [2]
  (b) Explain in brief–Pressure Transducers. [3]
- 5. (a)  $u = x^2 + y^2 + 2z^2$ ,  $v = -x^2y yz xy$ , find  $\omega$  to satisfy continuity. [3]
  - (b) Define path line and streak line and give the example of each.
    [2]

### Or

- 6. (a) Obtain a stream function to the following velocity components, u = x + y, and v = x - y. [3]
  - (b) Define : [2]
    - (*i*) Steady and unsteady flow,
    - (ii) Uniform and non-uniform flow.
- 7. (a) What is an orifice ? State the *two* differences between Orificemeter and Venturimeter. [2]
  - (b) Draw a neat sketch of Rotameter and explain its working in brief.[3]

#### Or

- 8. (a) List out the assumptions of Bernoulli's equation. [3]
  - (b) What do you understand by dynamics of fluid flow ? How does it differ from kinematics of fluid flow ? [2]

- **9.** (a) What is laminar sub-layer ? How is its existence established ? [4]
  - (b) Derive expression for boundary layer thickness, boundary shear stress and friction drag in a turbulent boundary layer. [6]
  - (c) A fluid of viscosity 0.8 N-s/m<sup>2</sup> and specific gravity 1.2 is flowing through a circular pipe of diameter 100 mm. The maximum shear stress at the pipe wall is given as 200.2 N/m<sup>2</sup>.
     Find :
    - (a) The pressure gradient
    - (b) The average velocity

Reynold's number of the flow. [5]

Or

- 10. (a) Define momentum thickness and derive an expression for the same. [5]
  - (b) For a steady laminar flow in a horizontal circular pipe derive expression for : [5]
    - (i) Shear stress,
    - (*ii*) The pressure drop.
  - (c) A laminar flow of oil of absolute viscosity 0.20 N-s/m<sup>2</sup> and density 900 kg/m<sup>3</sup> flows through a pipe of diameter of 0.35 m. If the head loss of 25m is observed in a length of 2500 m, determine : [5]
    - (*i*) The velocity of flow,
    - (*ii*) Reynold's number,
    - (*iii*) Friction factor.

### [5252]-506

3
- 11. (a) Three pipes, 300 m long and 300 mm diameter, 150 m long and 20 mm dia., 200 m long and 250 mm dia. are connected in series in same order. Pipe having 300 mm diameter is connected to the reservoir. Water level in the reservoir is 15 m above the centerline of the pipe which is horizontal. The respective friction factor for the pipes are 0.018, 0.02, and 0.019. Determine :
  - (i) Flow rate

(ii) Magnitude of loss of head in each pipe

The equivalent diameter of the single replacing the three pipes. [5]

- (b) Define minor energy losses and major energy losses in pipe.Enlist various types of minor losses in pipe flow. [4]
- (c) Write short notes on : [6]
  - (i) Prandtl's mixing length theory
  - (*ii*) Hydrodynamically smooth and rough pipes.

#### Or

12. (a) A farmer wishes to connect two pipes of different lengths and diameters to a common header supplied with 8×10<sup>-3</sup> m<sup>3</sup>/s of water from a pump. One pipe is 100 mm long and 5 cm in diameter. The other pipe is 800 m long. Determine the

diameter of the second pipe such that both pipes have the same flow rate. Assume the pipes to be laid on level ground and friction coefficient for both pipes as 0.02. Also determine the head loss in meters of water in the pipes. [5]

- (b) Derive Karman-Prandtl equation for velocity distribution in turbulent flow near hydrodynamically smooth boundary. [5]
- (c) Explain with sketches the difference between hydrodynamically smooth and rough boundaries. [5]

Seat	
No.	

# [5252]-507

# S.E. (Civil Engineering) (Second Semester) EXAMINATION, 2017 ARCHITECTURAL PLANNING AND DESIGN OF BUILDINGS (2015 PATTERN)

Time	:	Two	Hours							]	Max	timu	ım	Ma	ırks	:	50
N.B.	:—	(i)	Attempt	Q.	1	or	2,	Q.	3	or	4,	Q.	5	or	6,	Q.	7
			or Q. 8.														

- (ii) Figures to the right indicate full marks.
- (iii) Draw neat sketch wherever necessary.
- (a) Enlist documents to be submitted for seeking sanction for Building plan submitted to concerned authority. [6]
  - (b) Write a short note on importance of principles of architectural planning and explain any *one* in depth with sketch. [7]

#### Or

- 2. (a) Why DP is said be an important document for "Living" ?[6]
  (b) Enlist planning concepts for green building and explain any two. [7]
- 3. (a) Write a short note on necessity of abbreviations and perspective drawing. [6]
  - (b) Write a note on Smart Services. [6]

- **4.** (a) What do you mean by evacuation time ? Explain its role in disaster management. [6]
  - (b) Enlist the traps used for plumbing service and mention the function for any two.[6]
- 5. Draw to a scale 1 : 50 or otherwise developed plan for line plan as indicated in Figure 1. Assume suitably the tread/rise and width for the stairway for 3 m floor to floor height. Indicate the details like N line, door-window-ventilators and give the schedule for the same.
  [13]



Fig. 1

- Or
- 6. Draw to a scale 1 : 50 *or* otherwise developed plan using the following data :

The tread & rise for the stairway : 0.25 m, 0.15 m, Floor to floor height : 3.0 m, W.C. :  $1.2 \times 1$  sq. m., Bath :  $1.2 \times 2.1$  sq. m. Living room : 18 sq. m, Kitchen plus dining : 12 sq.m., Bedrooms 2 nos : 15 sq. m., Passage width 1 m. [13]

7. Draw to a scale of 1 : 50 or otherwise a line plan of a hospital building with 80 bed capacity. Assume suitable units for the same.Calculate the water requirement for the same. [12]

#### Or

B. Draw to a scale of 1 : 50 or otherwise a line plan of a hostel building with 80 bed capacity. Assume suitable units for the same.
Calculate the water requirement for the same. [12]

Seat	
No.	

# [5252]-508

# S.E. (Civil Engineering) (Second Semester) EXAMINATION, 2017 CONCRETE TECHNOLOGY

#### (2015 **PATTERN**)

#### **Time : Two Hours**

#### Maximum Marks : 50

- **N.B.** :- (i) Answer Q. Nos. 1 or 2, 3 or 4, 5 or 6, 7 or 8.
  - (*ii*) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Your answers will be valued as a whole.
  - (v) Use of electronic pocket calculator is allowed.
  - (vi) Assume suitable data, if necessary.
  - (vii) Use of IS code 10262,456 is not allowed.
- 1. (a) Enlist the basic ingredients of Portland cement and also state their ill effects if used in excess. [6]
  - (b) Explain difference between segregation and bleeding. State measures to be taken to avoid each. [6]

#### Or

- 2. (a) Write short note on classification of aggregates on the basis of : [6]
  - (*i*) Origin
  - (*ii*) Shape
  - (iii) Unit weight.
  - (b) What are the different methods to measure the workability?Explain any *one* in detail. [6]
- **3.** (a) Explain the relationship between compressive strength and tensile strength of concrete. [6]

(b) Describe the types of vibrators used for compaction of concrete. [6]

Or

- (a) State the various types of non-destructive tests carried on hardened concrete. Explain "Rebound hammer test with its limitations". [6]
  - (b) What is light weight concrete ? How it can be achieved in practice ? [6]
- 5. Using Indian Standard recommended guidelines, design a concrete mix for a reinforced concrete structure to be subjected to the mild exposure conditions for the following requirements : [13]
  - (A) Stipulations for proportioning :
    - (a) Grade designation : M25,
    - (b) Standard deviation : s = 4
    - (c) Type of cement : OPC 53 grade conforming to IS 8112
    - (d) Workability : 75 mm(slump)
    - (e) Degree of supervision : Good
    - (f) Type of aggregate : Angular coarse aggregate,
    - (g) Maximum cement content :  $450 \text{ kg/m}^3$
    - (h) Size of aggregate : 20 mm
  - (B) Test data for materials :
    - (a) Specific gravity of cement : 3.15
    - (b) Specific gravity of :
      - (i) Coarse aggregate 2.74
      - (ii) Fine aggregate 2.74
    - (c) Water absorption :
      - (i) Coarse aggregates 0.5%
      - (ii) Fine aggregates 1.00%

- (d) Free surface moisture :
  - (i) Coarse aggregates—Nil(absorbed moisture also nil)
  - (ii) Fine aggregates Nil
- (e) Sieve analysis :
  - (i) Coarse aggregate :

IS Sieve	Analysis of		Percentage			Remarks	
	C	oarse	of di	of different			
size	Agg	gregate	Fractions				
( <b>mn</b> )	Fr	action					
	Ι	II	Ι	II	Combined	Confirming	
			(60%)	(40%)	(100%)	of Table 2	
20	100	100	60	40	100	of IS 383	
10	0	71.2	0	28.5	28.5		
4.75		9.40		3.7	3.7		
2.36		0					

(ii) Fine aggregate : Conforming to grading zone I

(C)  $Design \ considerations$  :

Table 1 : From IS 10262; Maximum water content per cubic meter of concrete :

Sr. No.	Nominal Maximum	Maximum Water
	Size of	Content(kg)
	Aggregate(mm)	
<i>(i)</i>	10	208
(ii)	20	186
(iii)	40	165

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Table	2	: From	$\mathbf{IS}$	10262;	Volume	of	Coarse	Aggregate	$\operatorname{per}$	Unit
		Volum	le o	of Total	Aggrega	ate				

Sr.	Nominal Maximum	Volume o	f Coars	e Aggre	gate per		
No.	Size of Aggregate(mm)	Unit Volume of Total Aggregat					
		for Different Zones of Fine Ag-					
(1)	(2)	gregate					
		Zone	Zone	Zone	Zone		
		IV	III	II	Ι		
( <i>i</i> )	10	0.50	0.48	0.46	0.44		
<i>(ii)</i>	20	0.66	0.64	0.62	0.60		
(iii)	40	0.75	0.73	0.71	0.69		

 Table 3 : From IS 456, Different Exposure conditions for reinforced concrete

Sr No.	Exposure	Minimum	Maximum	Minimum
		coment	coment free water	
		content	cement	concrete
		(kg/cubic m)	ratio	
<i>(i)</i>	Mild	300	0.55	M20
( <i>ii</i> )	Moderate	300	0.50	M25
(iii)	Severe	320	0.45	M30
(iv)	Very severe	340	0.45	M35
( <i>v</i> )	Extreme	360	0.40	M40
		Or	-	

6. (a) What do you mean by concrete mix design ? What are the objectives in mix. design ? [4]

- (b) What do you mean by :
  - (i) Mean strength
  - (*ii*) Variance
  - (iii) Standard deviation
  - (iv) Coefficient of variation.
- (c) Explain DOE method of mix design in brief. [5]

[4]

- 7. (a) Explain the durability of concrete ? What effect of water cement ratio makes on durability ? [5]
  - (b) Write short notes on : [8]
    - (i) Evaluation of cracks and its necessity
    - (*ii*) Attack by sea water.

- 8. (a) What are the symptoms and diagnosis of distress of concrete ? [5]
  - (b) Write short notes on :
    - (i) Carbonation of concrete and its determination

[8]

(*ii*) Shotcrete.

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**Time : Two Hours** 

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Maximum Marks : 50

### S.E. (Civil) (Second Semester) EXAMINATION, 2017 STRUCTURAL ANALYSIS-I

#### (2015 Pattern)

N.B. :- (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5, or Q. 6, Q. 7 or Q. 8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (*iii*) Figures to the right indicate full marks.
- (iv) Assume suitable data, if necessary.
- (v) Use of electronic pocket calculator is allowed.
- (a) Write note on Degree of freedom, Determinacy and Indeterminacy. [6]
  - (b) Find slope and deflection at points 'B' and 'C' for cantilever beam by moment area method.[6]



2. (a) Determine static and kinematic indeterminacy of the following beams. : [6]



(b) Determine deflection at 'C' by Castigliano's first theorem. [6]



3. (a) A cantilever truss shown below is loaded by a vertical force of 10 kN at free end. Find the total deflection at the free end in terms of AE which is constant. [6]



(b) A uniformly distributed load of 10 kN/m intensity, 4 m in length crosses a girder of span 30 m from right to left. With the help of influence lines, determine the values of shear force and bending moment at a point of 10m from left end when the head of the load is 12 m from the left support. [6]



4. (a) Determine total deflection of joint 'C'. A = 100 mm<sup>2.</sup>, E = 200 GPa. [6]



(b) For the cantilever beam shown below, calculate reactions at fixed end by influence line diagram method. Also draw influence line diagrams.



- 5. A three hinged parabolic arch is loaded and supported as shown in figure below. Determine : [13]
  - (a) Support reactions
  - (b) Maximum positive and negative bending moment.



- 6. Determine horizontal thrust for a two hinged parabolic arch of span 'L' and central rise 'H' carries a point load 'W' at a distance 'a' from left hand support. Assume  $I = I_0 \sec \theta$ . [13]
- **7.** (*a*) Explain :
  - (*i*) Plastic Moment
  - (*ii*) Plastic Collapse
  - (iii) Elastic-Plastic behavior of beam
  - (b) For the cross-section of the beam shown below find the shape factor. [7]



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8. (a) For the cross-section shown below, find the shape factor.
[7]



(b) Write note on Shape factor and Plastic section modulus. [6]

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### S.E. (Civil Engineering)(Second Semester) EXAMINATION, 2017 ENGINEERING GEOLOGY

#### (2015 PATTERN)

Time : Two HoursMaximum Marks : 50

- **N.B.** :— (i) Solve/Write the answers to any *four* questions in single answer-book only.
  - (ii) Neat diagram must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.
- (a) Define Mineral. Explain in detail Hardness and Fracture properties of mineral. [6]
  - (b) Draw and describe types of unconformity. [6]

Or

- (a) Give the classification of Igneous rocks based on mode of occurrence.
  - (b) What is fault ? Explain Normal and Reverse Faults with neat sketch. [6]
- **3.** (a) Explain various features developed due to river erosion. [6]
  - (b) Explain in detail surface geological Investigations. [6]

Or

**4.** (a) Describe Physiographic divisions of India with their engineering significance. [6]

(b) What is Remote sensing ? Explain uses of remote sensing in Civil Engineering. [6]

- 5. (a) Discuss the feasibility of dam site, with dipping and horizontal strata. [7]
  - (b) Explain Preliminary Geological Investigations carried out for Tunneling. [6]

#### Or

- 6. (a) Explain influence of Geological conditions on choice of type of Dam. [7]
  - (b) Proposed sites for excavation of tunnel are A-B and X-Y, passing through Axial and limb regions of fold respectively. Justify the suitability of sites.
- 7. (a) Explain the Geological conditions favorable for natural springs and artesian wells. [7]
  - (b) What is landslide ? Explain control measures of landslides.

[6]

#### Or

- 8. (a) Explain various types of aquifers. [7]
  - (b) What are the requirements of good building stone ? [6]

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No.	

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### S.E. (Mechanical/Mech.Sand.) (First Semester) EXAMINATION, 2017 ENGINEERING MATHEMATICS-III (2015 PATTERN)

#### **Time : Two Hours**

(*b*)

#### Maximum Marks : 50

- N.B.: (i) Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.

1. (a) Solve any 
$$two$$
 of the following : [8]

- (i)  $(D^2 4D + 3)y = x^3e^{2x}$
- (*ii*)  $(D^2 + 4)y = \sec 2x$  (using method of variation of parameter)

(*iii*) 
$$x^2 \frac{d^2 y}{dx^2} - 4x \frac{dy}{dx} + 6y = x^5$$
.  
Find Fourier sine transform of : [4]

$$\frac{e^{-ax}}{x} \quad \text{where} \quad x > 0.$$

2. (a) A body of weight W = 3N streches a spring of 15 cm. If the weight is pulled down 10 cm below the equilibrium position and given a downward velocity 60 cm/sec, determine the amplitude, period and frequency of motion. [4]

(b) Solve any one :

(i) Find the Laplace transform of :

$$e^{-4t}\int_0^t \frac{\sin 3t}{t} dt$$
 .

(ii) Obtain the Inverse Laplace transform of :

$$\frac{2s+5}{s^2+4s+13}$$

(c) Using Laplace transform solve the differential equation :[4]

$$\frac{dy}{dx} + 2y(t) + \int_0^t y(t)dt = \sin t, \quad \text{given } y(0) = 1.$$

- 3. (b) The first four central moments about the working mean 30.2 of a distribution are 0.255, 6.222, 30.211 and 400.25. Calculate the first four moments about the mean. Also evaluate  $\beta_1$ ,  $\beta_2$ and comment upon the skewness and kurtosis of the distribution. [4]
  - (b) In a certain examination test, 2000 students appeared in a subject of mathematics. Average marks obtained were 50% with standard deviation 5%. How many students do you expect to obtain more than 60% of marks, supposing that marks are distributed normally.

(Given : A 
$$(z = 2) = 0.4772$$
). [4]

(c) Find the directional derivative of φ = xy<sup>2</sup> + yz<sup>3</sup> at (1, -1, 1) along the direction normal to the surface x<sup>2</sup> + y<sup>2</sup> + z<sup>2</sup> = 9 at (1, 2, 2).

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[4]

- 4. (a) The two regression equations of the variables x and y are x = 19.13 0.87y, y = 11.64 0.50x, find x̄, ȳ and coefficient of correlation between x and y. [4]
  - (b) Prove the following (any one) : [4]
    - (i)  $\overline{b} \times \nabla [\overline{a} \cdot \nabla \log r] = \frac{\overline{b} \times \overline{a}}{r^2} \frac{2(\overline{a} \cdot \overline{r})}{r^4} (\overline{b} \times \overline{r})$

$$(ii) \qquad \nabla^4(r^2\log r) = \frac{6}{r^2}$$

(c) Show that the vector field :  

$$\overline{F} = (y^2 \cos x + z^2)\overline{i} + (2y \sin x)\overline{j} + 2xz\overline{k}$$
 is irrotational and find  
scalar field such that  $\overline{F} = \nabla \phi$ . [4]

5. (a) Evaluate using Green's theorem  $\int_C \overline{F} \cdot d\overline{r}$  where  $\overline{F} = x^2\overline{i} + xy\overline{j}$ and 'C' encloses the region of first quadrant of circle  $x^2 + y^2 = 1$ . [4]

(b) Use divergence theorem to evaluate  $\iint_{S} \overline{F} \cdot d\overline{S}$ , where

 $\overline{F} = y^2 z^2 \overline{i} + z^2 x^2 \overline{j} + x^2 y^2 \overline{k}$  and S is the upper part of the sphere  $x^2 + y^2 + z^2 = a^2$  above the *xoy* plane. [5]

(c) Evaluate  $\iint_{\mathbf{S}} (\nabla \times \overline{\mathbf{F}})$ .  $\hat{n} \, d\mathbf{S}$  for the surface of the paraboloid :

3

$$z = 4 - x^2 - y^2 (z \ge 0)$$
 and  $\overline{\mathbf{F}} = y^2 \overline{i} + z\overline{j} + xy\overline{k}$ . [4]

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6. (a) Evaluate 
$$\int_{c} \overline{F} \cdot d\overline{r}$$
,  $\overline{F} = xy\overline{i} + x^{2}\overline{j}$ , where C is the curve  $y^{2} = x$ ,  
joining (0, 0) and (1, 1). [4]

(b) Evaluate 
$$\iint_{S} (x^{3}\overline{i} + y^{3}\overline{j} + z^{3}\overline{k}) \cdot d\overline{S}$$
, where S is the surface of the sphere  $x^{2} + y^{2} + z^{2} = a^{2}$ . [4]

(c) Evaluate 
$$\iint_{S} (\nabla \times \overline{F}) \cdot \hat{n} dS$$
 for the surface of first quadrant of

the ellipse 
$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$
 and  $\overline{\mathbf{F}} = -y^3\overline{i} + x^3\overline{j}$ . [5]

7. (a) If 
$$\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$$
 represents the vibration of a string of length   
 $l$  fixed at both ends, find the solution with boundary conditions :  
(i)  $y(0, t) = 0$   
(ii)  $y(l, t) = 0$   
(iii)  $\frac{\partial y}{\partial t} = 0$  at  $t = 0$   
(iv)  $y(x, 0) = 3(lx - x^2), 0 \le x \le l$  [7]  
(b) Solve  $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$  if,  $u$  is finite for all  $t$ 

$$(i) \quad u(0, t) = 0^{\circ}$$

$$(ii) \quad u(l, t) = 0$$

$$(iii) \quad u(x, 0) = 50, \ 0 < x < 1$$
[6]

8. (a) Solve the equation 
$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$
 with conditions :  
(i)  $u(0, \infty) = 0$   
(ii)  $u(0, y) = 0$   
(iii)  $u(10, y) = 0$   
(iv)  $u(x, 0) = 100 \sin\left(\frac{\pi x}{10}\right), 0 \le x \le 10$ . [6]  
(b) Use Fourier sine transform to solve the equation  
 $\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2}, 0 \le x \le \infty, t \ge 0$  subject to the following conditions:

(i) 
$$u(0, t) = 0, t > 0$$
  
(ii)  $u(x, 0) = e^{-x}, x > 0$   
(iii)  $u$  and  $\frac{\partial u}{\partial x} \rightarrow 0$  as  $x \rightarrow \infty$  [7]

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Or

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### S.E. (Mechanical/Auto.) (First Semester) EXAMINATION, 2017 MANUFACTURING PROCESSES-I

#### (2015 **PATTERN**)

Time : Two Hours

Maximum Marks : 50

- $N.B. := (i) \quad \text{All questions are compulsory i.e. solve Q.1 or Q.2, Q.3}$ or Q.4, Q.5 or Q.6, Q.7 or Q.8.
  - (ii) Figures to the right indicate full marks.
  - (iii) Assume suitable data, if necessary.
  - (iv) Neat diagrams must be drawn wherever necessary.
- 1. (a) Compare hot chamber die casting process with cold chamber die casting process with schematic sketches. [6]
  - (b) A high carbon steel solid cylindrical piece having diameter 45 mm and height 88 mm is reduced in height by 25% at room temperature using open die forging. Calculate the forging force at the end of stroke assuming the coefficient of friction as 0.15 and the work metal strength coefficient 'K' as 425 MPa and strain hardening exponent 'n' as 0.15.

#### Or

2. (a) Explain the principle of roll forging process with a neat sketch.[6]
(b) A cylindrical riser for which diameter of the riser is equal to the height of the riser is to be designed for a sand casting mould for the size of steel casting as 35 mm × 60 mm × 25 mm. The previous observations indicated the total solidification time for the said casting is 72 second. However, find the size of the riser to obtain total solidification time of 112 seconds. [6] P.T.O.

- 3. (a) With a schematic explain the principle and working of injection moulding process. [6]
  - (b) State various arc welding and gas welding processes. Explain the principle and working of any *one* type of gas welding process.
     [6]

- 4. (a) Explain with neat sketch the principle of film extrusion process. [6]
  - (b) State various resistance welding processes. Explain the principle and working of any one type of resistance welding process. [6]
- 5. (a) Discuss with neat sketches various methods that are used to reduce the cutting forces in sheet metal working. [6]
  - (b) What is centre of pressure ? Explain method of calculating centre of pressure for a 'Tee' section having flange dimensions 80 × 20 mm and web dimensions 20 × 80 mm. Overall height of the 'Tee' section is 100 mm. [7]

#### Or

- 6. (a) With neat sketches explain the various drive mechanisms that are used for sheet metal presses. [6]
  - (b) A cup of internal diameter 40 mm, height 65 mm is to be drawn from a 1.6 mm cold rolled steel with ultimate tensile strength of 360 MPa. The corner radius for cylindrical cup is 1.2 mm. Percentage reduction pormitted in the first draw is 50% and in the second, third and fourth draw is 35%, 20% and 15% respectively. Consider trimming allowance of 3.2 mm for each 25 mm of cup diameter. Find size of the blank, number of draws required, punch and die dimensions and drawing pressure for each draw. Consider value of die constant 'c' as 0.7 and value of punch and die clearance as 1.15 times thickness of sheet. [7]

- 7. (a) State the different accessories used on lathe and state the purpose of each one. [6]
  - (b) Calculate the change gears for cutting two start left hand threads of 2.4 mm pitch on a lathe having 6 mm pitch lead screw. Available gears are 20 to 120 teeth in steps of 5. Sketch the gear train and suggest what modification is required for cutting right hand threads ? [7]

- 8. (a) Explain with a neat sketch taper turning operation to be carried on lathe out using a taper turning attachment. [6]
  - (b) A workpiece of 90 mm diameter is to be turned down to 82 mm diameter. The length of the workpiece is 124 mm. The maximum allowable depth of cut is 0.8 mm. Assume feed as 0.22 mm/rev and cutting speed as 250 m/min. If the approach length is 25 mm and over travel is 15 mm then calculate the spindle revolution (RPM) and machining time for each pass if feed as 0.22 mm/rev and cutting speed as 250 m/min is kept constant for all the passes. Also, find the total machining time for all the passes. [7]

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No.	

# [5252]-513

### S.E. (Mechanical/Automobile/Sandwich) (First Semester) EXAMINATION, 2017 THERMODYNAMICS

#### (2015 PATTERN)

#### **Time : Two Hours**

# Maximum Marks : 50

- N.B. :- (i) Solve 4 questions, Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.
  - (*ii*) Answer for the four questions should be written in same answer book, attach supplement if required.
  - (iii) Neat Diagrams should be drawn wherever necessary.
  - (*iv*) Use of steam tables, Psychrometric chart, Mollier Charts, Scientific calculator is allowed.
  - (v) Use of pocket calculator and different gas charts as applicable is allowed.
  - (vi) Assume suitable data if necessary.
  - (v) Figures to the right indicate full marks.

#### 1. (a) Define and explain on P-v diagram : [6]

- (i) Thermodynamics state
- (ii) Thermodynamics Process and
- (iii) Thermodynamics Cycle.
- (b) Experimental data of Specific heat capacity measurement of air at constant Pressure are as follows : [6]
  - 1. Mass of air = 0.05 kg
  - 2. Air heated from 287 K to 347 K for 300 seconds using a heater with input Power-10.04 W.
  - 3. Adiabatic index = 1.4.

Determine :

- 1. Specific heat of air at constant pressure,
- 2. Characteristic gas constant of Air (R) and
- 3. Density of air at 273 K and 1 bar.

#### Or

- 2. (a) Draw any three of the following processes : [6]
  - (i) Constant Pressure or Isobaric process on P-v diagram.
    - (ii) Constant Volume or Isochoric Process on P-v diagram.
    - (*iii*) Constant temperature or Isothermal Process on T-s diagram.
    - (*iv*) Reversible Adiabatic or Isentropic Process on T-s diagram.
  - (b) The COP of the Carnot refrigerator is 6, when it maintains the temperature of 270 K in the evaporator. Determine the condenser temperature and Refrigerating effect if the power required to run the refrigerator is 7.5 kW. [6]
- (a) Define and explain any six of the following terms with neat sketch showing piston, cylinder arrangement for air standard cycle :
  - (*i*) Clearance volume
  - (*ii*) Swept volume
  - (*iii*) Total Volume
  - (*iv*) TDC
  - (v) BDC
  - (vi) Compression ratio
  - (vii) Air standard efficiency.
  - (b) A throttling calorimeter is used to determine the dryness fraction of the steam using steam at 10 bar. The condition of steam after throttling is 1.2 bar, 118 deg. C. Calculate the dryness fraction of the steam assuming Cp=2.1 kJ/kg. [6]

- (a) State and explain different components of Rankine cycle on flow diagram and draw the Thermodynamic cycle on T-s diagram.
  - (b) A refrigerating system operates on reversed Carnot cycle. The higher temperature of the refrigerant in the system is 308 K and the lower temperature is 258 K. Refrigerating effect of the refrigerator is 42.2 kW.
     Determine : [6]
    - (i) COP and
    - (*ii*) heat rejected from the system.
- **5.** (a) Give the function and location of any *three* of the following: [6]
  - (i) Super heater
  - (ii) Air pre heater
  - (*iii*) Fusible plug
  - (iv) Water level indicator
  - (v) Spring loaded safety value.
  - (b) The following results were obtained in a boiler trial : [7]
    - (i) Feed water per hour = 700 kg at 27 deg. C
    - (ii) Steam produced at 8 bar and 0.97 dry.
    - (iii) Coal used = 100 kg/hr having CV of coal = 25000 kJ/kg
    - (iv) Ash and Unburnt coal collected = 7.5 kg/hr having CV
       = 2000 kJ/kg
    - (v) Mass of flue gases produced per kg of fuel burnt = 17.3 kg
    - (vi) Flue gas temperature = 327 deg. C

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(vii) Room temperature = 16 deg. C

(viii) Specific heat of flue gases = 1.025 kJ/kg K

Draw the energy balance on minute basis.

#### Or

**6.** (a) Derive the formula for :

- (i) Equivalent evaporation and
- (*ii*) Boiler efficiency.
- (b) How much air is used per kg of coal burnt in a boiler having chimney of 32.3 m height to create the draught of 19 mm of water column when the temperature of the flue gases in the chimney is 370 deg. C and the temperature of the boiler house is 29.5 deg. C.
- 7. (a) Define Human comfort condition and discuss the factors affecting human comfort. [6]
  - (b) Atmospheric air at 30 deg. C DBT and 18 deg. C WBT is cooled to 20 deg. C DBT without changing its moisture content.
     Find : [7]
    - (i) Initial enthalpy and specific humidity of air,
    - (ii) Final relative humidity of air and WBT,
    - (iii) Sensible heat removed per kg of air.

#### Or

- 8. (a) Define the following terms :
  - (i) DBT
  - (ii) Specific humidity
  - (iii) WBT
  - (*iv*) Relative humidity
  - (v) Degree of saturation
  - (vi) DPT.

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[6]

[6]

- (b) Moist air enters a steam heating coil at 10 deg. C, 50% RH which is heated sensibly and leaves the coil at 30 deg. C. The mass flow rate of the moist air is 50 kg/s.
   Find :
  - (i) Sensible heat gained by air,
  - (ii) Mass flow rate of the steam in the coil if the steam enters the coil as saturated steam and the condensate leaves the coil at 85 deg. C at atmospheric pressure. [7]

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S.E. (Mechanical/Automobile Engg.) (First Semester)

#### EXAMINATION, 2017

#### MATERIAL SCIENCE

#### (2015 PATTERN)

Time : Two Hours

- Maximum Marks : 50
- **N.B.** :- (i) Neat diagrams must be drawn wherever necessary.
  - (ii) Figures to the right side indicate full marks.
  - (*iii*) Use of calculator is allowed.
  - (*iv*) Assume suitable data, if necessary.
  - (v) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6,
    Q. 7 or Q. 8.
- 1. (a) Calculate no. of Atoms per Unit cell for BCC and FCC metal with proper formula. [6]
  - (b) If a metal is forged what difference will be seen in its the following properties and explain why ?[6]
    - 1. Surface finish
    - 2. Dislocation density
    - 3. Internal stresses.

- 2. (a) What is polymer and what are the polymeric arrangements in polymer ? Which properties of ceramics makes them different than metal ? [4]
  - (b) Show the following planes on a cubic structures : [4]
    - (1) (111)
    - (2) (010)
  - (c) Explain work hardening with respect to dislocation theory in detail. [4]
- (a) Suggest the suitable hardness tester for the following applications (any *three*) and justify your answer. [8]
  - (1) Gray cast iron casting
  - (2) Hardened steel component
  - (3) Porous powder metallurgical parts
  - (4) Hardness of Cr which is plated
  - (b) If two metals should be joined together in assembly which joining method should be preferred to increase its corrosion resistance and explain why ? [5]

(a) Suggest different techniques used to increase corrosion resistance of metals. [7]

 $\mathbf{2}$ 

- (b) Draw the self explanatory diagram for the following(any two): [6]
  - (i) Stress strain diagram for 0.4% carbon steel
  - (*ii*) Izode test specimen
  - (iii) X-ray tube used in X-ray radiography
  - (iv) Through transmission Ultrasonic test.
- 5. (a) In which surface improvement process it changes its chemical composition on surface ? Explain the process in detail. [6]
  - (b) Draw the self explanatory diagram for the following [6]
    - (*i*) Electroplating
    - (*ii*) Powder coating

- 6. Suggest the suitable surface coating process for the following applications (and *four*) and give proper justification for the selection. [12]
  - (i) Cr is to coated on handles of door
  - (*ii*) Slides in park
  - (iii) Semiconductor
  - (*iv*) Exterior roofs
  - (v) Coating of Titanium nitride on carbide tool
  - (vi) Corrosion protection of aircraft structural steel parts.

#### [5252]-514

- 7. (a) Why is it necessary to control furnace atmosphere in sintering ? [4]
  - (b) Explain physical method for manufacturing of powders. [5]
  - (c) Write down the common flow chart used in powder metallurgy. [4]

- **8.** (a) Define the following : [4]
  - (*i*) Compatibility
  - (*ii*) Flowability
  - (b) Is liquid phase and solid phase sintering is same ? [3]
  - (c) List important disadvantages and applications of powder metallurgy over other processes. [6]

Seat	
No.	

### [5252]-515

## S.E. (Mechanical) (First Semester) EXAMINATION, 2017 STRENGTH OF MATERIALS

(Common to Mechanical/Auto Engineering)

#### (2015 PATTERN)

Time : Two Hours

Maximum Marks : 50

- N.B. :- (i) Solve Q. 1 or 2, Q. 3 or 4, Q. 5 or 6, Q. 7 or Q. 8.
  - (*ii*) Figures to the right indicate full marks.
  - (iii) Use of electronic pocket calculator is allowed.
  - (*iv*) Assume suitable data if necessary.
- 1. (a) A composite bar as shown in Fig. 1 is loaded by various axial forces. Determine largest value of force P such that stresses in the steel do not exceed 150 Mpa and that in brass does not exceed 75 Mpa. Take  $E_s = 200$  GPa.  $E_b = 75$  GPa. Also find total deformation of composite bar. [6]



Fig. 1

(b) Draw SFD and BMD for the beam shown in Fig 2. Also find point of contra-flexure if any. [6]



#### Or

- 2. (a) A reinforced concrete column  $300 \times 300$  mm has four reinforcing steel bars of 25 mm diameter. Find safe axial load on the column when the concrete is subjected to stress of 5 N/mm<sup>2</sup>. What is corresponding stress in steel ? Take  $E_s/E_c=18$  [6]
  - (b) Fig 3 shows SFD. Draw loading diagram and BMD. Also find point of contraflexure if any. [6]



3. (a) A simply supported beam of 8 m length is loaded as shown in Fig 4. Find deflection under each load. Take E = 210 GPa and  $I = 180 \times 10^6$  mm<sup>4</sup>. [6]



 $\mathbf{2}$
(b) Calculate intensity of UDL that SSB of span 4 m and of cross-section as shown in Fig. 5 can carry if permissible stresses in bending are 120 MPa in compression and 40 MPa in tension.







4. (a) A steel section as shown in Fig. 6 is subjected to a shear force of 200 kN. Determine the shear stress at key points and sketch the shear stress distribution diagram. [6]



Fig. 6

- (b) A one metre long bar of rectangular cross-section 50 mm
   × 80 mm is subjected to axial load of 1.2 kN. Determine the Maximum stress and strain energy developed in the bar if load applied :
  - (i) is gradual, and
  - (*ii*) falls through height of 25 mm. [6]

### [5252]-515

- 5. (a) A shaft of hollow circular section has outer diameter 120 mm, inner diameter 100 mm. Permissible shear stress is 95 MPa. Angle of twist is not to exceed  $3.6^{\circ}$  in a length of 3 m. Maximum torque is 30% excess of mean torque. Speed of shaft is 2 RPS. Determine Maximum power transmitted by shaft. Take G = 80 GPa. [7]
  - (b) A simply supported beam of I section as shown in fig. 7 deflects
     12 mm when subjected to Udl of 50 kN/m. Determine safe
     load if beam is used as column with both ends fixed. Use
     Euler's formula with factor of safety 5. Take E = 205 GPa. [6]



### Fig. 7 Or

- (a) A solid shaft of 160 mm diameter has same cross-sectional area as that of hollow shaft of same material of inside diameter 110 mm. Find ratio of power transmitted by two shafts of same angular velocity.
- (b) A steel bar of rectangular cross-section  $55 \times 45$  mm pinned at each end and subjected to axial Compression. The bar is 2.3 m long and E = 210 GPa. Compare Euler's critical load with Rankine load. Take  $\sigma_c = 550$  MPa and a = 1/1600.[7]

7. (a) A plane element is subjected to stresses as shown in fig 8.
 Determine principal stresses, maximum principal stress and position of principal plane. [7]



#### Fig. 8

(b) A shaft is subjected to maximum torque of 14 kN-m and maximum bending moment of 10 kN-m determine diameter of shaft according to maximum shear stress theory. Elastic limit in simple tension test is 180 MPa.

#### Or

- 8. (a) In simple tension test, a test specimen of 10 mm diameter is gradually loaded from zero to 20 kN within elastic limit. Draw Mohr's circle and find Maximum shear stress developed.
  [6]
  - (b) The axial pull of 20 kN along with a shear force of 15 kN is applied to circular bar of 20 mm diameter. The elastic limit of material is 230 MPa and Poisson's ratio is 0.3 Determine factor of safety according to :
    - (i) Maximum shear stress theory
    - (*ii*) Maximum shear strain energy theory. [7]

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### [5252]-516

### S.E. (Mechanical/Auto.) (Second Semester) EXAMINATION, 2017 FLUID MECHANICS

### (2015 Course)

### Time : Two Hours

### Maximum Marks : 50

- **N.B.** :- (i) Neat diagram must be drawn wherever necessary.
  - (ii) Figures to the right indicate full marks.
  - (*iii*) Use of logarithmic tables, slide rule, Mollier charts, Electronic pocket calculator, Steam tables and p-h chart is allowed.
  - (iv) Assume suitable data, if necessary.
- **1.** (a) Explain :
  - (i) Surface tension
  - (ii) Compressibility
  - (*iii*) Vapour pressure. [6]
  - (b) The velocity vector in a fluid flow is given  $V = (2x^3)_i^2 (5x^2y)_j^2 + (2tz)\hat{k}$ . Obtain expression for velocity vector and acceleration vector at a point (2, 1, 3) at time t = 1 s Also calculate the value of velocity and acceleration at the given point. [6]

**2.** (a) Derive an expression for continuity equation. [6]

- (b) A square plate  $6m \times 6m$  is placed in a liquid of specific gravity 0.8 at an angle of  $30^{\circ}$  with free liquid surface. A square hole of  $1.5m \times 1.5m$  is cut exactly in centre of the plate. Its greatest and the least depths below the free liquid surface are 5mand 2m respectively. Determine the total pressure on one face of the plate and position of centre of pressure. [6]
- 3. (a) Derive Euler's equation for flow along stream line and deduce the Bernoulli's equation for the same. [6]
  - (b) A 0.2 m diameter pipe carries liquid in laminar region. A Pitot tube placed in the flow at a radial distance of 15 mm from the axis of the pipe indicates velocity of 0.5 m/s. Calculate:
    - (*i*) The maximum velocity
    - (*ii*) The mean velocity
    - (*iii*) The discharge in the pipe. [6]

- 4. (a) Derive an expression of velocity and shear stress distribution for laminar flow between fixed parallel plates. [6]
  - (b) The inlet and throat diameters of horizontal venturimeter are 30 cm and 10 cm respectively. The liquid flowing through the meter is water. The pressure intensity at inlet is 13.734 kN/m<sup>2</sup> while vacuum pressure head at the throat is 37 cm of mercury. Find the rate of flow. Assume that 4% of the differential heads is lost between the inlet and outlet. Find also the value of  $C_d$  for venturimeter. [6]

- 5. (a) A 2500 m long pipeline is used for transmission of power. 120 kW power is to be transmitted through the pipe in which water having a pressure of 4000 kN/m<sup>2</sup> at inlet is flowing. If the pressure drop over the length of pipe 800 kN/m<sup>2</sup> and f = 0.042. Find : [7]
  - (*i*) Diameter of the pipe.
  - (*ii*) Efficiency of transmission.
  - (b) Explain :
    - (*i*) Mach Number
    - (*ii*) Froude Number
    - (*iii*) Euler Number. [6]

6. (a) Discharge Q of a centrifugal pump can be assumed to be dependent on density of liquid ρ, viscosity of liquid μ, pressure, impeller diameter D, and speed N in RPM. Using Buckingham π-theorem, show that : [7]

$$Q = ND^{3}\phi\left[\frac{gH}{N^{2}D^{2}}, \frac{v}{ND^{2}}\right]$$

- (b) Derive an expression for Darcy-Weisbach equation. [6]
- 7. (a) Write a short note on "Boundary layer formation over flat plate. [7]

$$[5252]-516$$

- (b) For the following velocity profiles in the boundary layer. Show that whether the boundary is attached, detached or on the verge of separation : [6]
  - (*i*)  $u/U = 2\eta \eta^2 + 3\eta^3$
  - (*ii*)  $u/U = -2\eta + \eta^3 + 2\eta^4$ ,
  - (*iii*)  $u/U = 2\eta^2 + 5\eta^3 + 2\eta^4$  where  $\eta = y/\delta$ .

- 8. (a) Derive an expression for displacement, momentum and energy thicknesses. [9]
  - (b) What is drag and Lift ? Explain different types of drag on an immersed body. [4]

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### [5252]-517

### S.E. (Mechanical/Auto.) (Second Semester) EXAMINATION, 2017 THEORY OF MACHINES I

### (2015 COURSE)

### **Time : Three Hours**

### Maximum Marks : 70

- **N.B.** :— (i) Neat diagrams must be drawn wherever necessary.
  - (*ii*) Figures to the right indicate full marks.
  - (iii) Use of electronic pocket calculator is allowed.
  - (iv) Assume suitable data, if necessary.
- (a) Define 'inversion' and explain with neat sketches any two inversions of single slider kinematic chain, giving their practical applications. [5]
  - (b) Describe with neat sketches 'Dynamically Equivalent System. [5]

#### Or

- 2. (a) Define Grashoff's law. State how it is helpful in classifying the four link mechanism into different types. [4]
  - (b) The obliquity ratio of a vertical reciprocating engine is 4.5. The engine bore and stroke is 75 mm and 90 mm respectively. The engine rotates at 2200 rpm. The mass of the reciprocating parts is 1.2 kg. The gas pressure intensity is 5.5 bar. When it has moved 50° from the IDC on its power stroke, determine the piston effort. At what engine speed will be load on the gudgeon pin at crank pin be zero ? [6]

- 3. (a) Describe with neat sketch the construction and working of
   Belt Transmission Dynamometer. [5]
  - (b) Two shafts P and Q are connected by Hookes coupling and have their axes included at 15°. If the shaft P rotates at a uniform speed of 1200 rpm, find the maximum acceleration of shaft Q and the angular positions of the shaft P at these instants. [5]

- (a) Explain loop closure equation for four bar mechanism. [4]
  (b) A single plate clutch, effective on both sides, is required to transmit 25 kW at 3000 rpm. Determine the outer and inner radii of friction surface if the coefficient of friction is 0.255, the ratoi of radii is 1.25 and the maximum pressure is not to exceed 0.1 N/mm<sup>2</sup>. Also determine the axial thrust to be provided by springs. Assume the theory of uniform wear. [6]
- 5. (a) Explain with the help of neat sketch the concept of 'Velocity Image Principle'. [4]
  - (b) The cofiguration of wrapping machine is shown in Fig. 1 Determine by using ICR method, the velocity of point P on bell crank lever PQR, if the crank rotates at 80 rad/s. The dimensions of various links are OA = 150 mm, AB = 950 mm,

CB = 250 mm, BD = 400 mm, CR = 350 mm, QR = 250 mm and PQ = 600 mm. [11]



Fig. 1

### Or

6. (a) State and explain Kennedy's theorem. [4]

(b) The Fig. 2 shows four link mechanism. The link AB has angular velocity of 10.5 rad/s in counterclockwise direction. Find velocity of midpoint of link DGC and angular acceleration of link BCF.
 The dimensions of links are AD = 100 mm, AB = 50 mm,

BC = 66 mm, CD = 56 mm, BF = 45 mm, CF = 30 mm, CG = 24 mm and GD = 44 mm. [11]



Fig. 2

- (a) Explain with neat drawing the procedure of Kleins construction to determine acceleration of piston of slider crank mechanism, when crank rotates with angular velocity ω and angular acceleration α.
  - (b) The Fig. 3 shows Scoth Yoke Mechanism. The length of the crank OP is 200 mm. At the instant shown in fig. the crank OP has angular velocity of 10 rad/s and angular acceleration

of 30 rad/s<sup>2</sup>. Determine the acceleration of slider P in the guide and the horizontal acceleration of guide. [10]



- 8. (a) In the Fig. 4, show the Coriolis component of acceleration of link with direction for the following *two* cases :
  - (i) Crank OA rotates in clockwise direction.
  - (*ii*) Slider A moving towards fixed point Q. [4]



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- (b) In the IC engine mechanism the crank radius is 300 mm and length of connecting rod is 1050 mm. The crank is rotating with uniform angular velocity of 60 rad/s clockwise. Determine when crank at 120° from IDC by using Kliens construction.
   (i) Acceleration of piston;
  - (ii) Angular acceleration of connecting rod.

The line of stroke of slider passes through fixed point. [11]

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### [5252]-518

### S.E.(Mechanical and Automobile Engineering) (Second Semester) EXAMINATION, 2017

### ENGINEERING METALLURGY

### (2015 PATTERN)

### Time : Two Hours

### Maximum Marks : 50

- N.B. :- (i) Answer four questions : Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii) Neat diagram should be drawn wherever necessary.
  - (*iii*) Use of non-programmable electronic pocket calculator is allowed.
  - (iv) Figures to the right indicate full marks.
  - (v) Write answers relevant to the question. Irrelevant statements will not score marks.
- 1. (a) Define the following terms : [1+1+1+1=4]
  - 1. Phase
  - 2. Alloy
  - 3. Grain
  - 4. Nucleation.
  - (b) Differentiate between microscopy and macroscopy. [4]
  - (c) What is the purpose of using etchant ? Explain with diagram. [2+2=4]

### Or

- **2.** (a) Write Hume Rothery's rule of solid solubility. [4]
  - (b) Explain any two methods of grain size measurement. [2+2=4]

- (c) Differentiate between transmission electron microscope and scanning electron microscope. [4]
- 3. (a) What are the different types of cast iron ? Explain gray cast iron microstructure. State and justify the use of grey cast iron in two applications. [2+2+2=6]
  - (b) Draw neat diagram of microstructures and indicate phases present and their amounts into the following plain carbon steels under equilibrium conditions : [2+2=4]
    - (i) 0.2 % carbon steel,
    - (ii) 0.8 % carbon steel.
  - (c) Give brief explanation of austenite to pearlite transformation?
    [3]

- (a) On an Iron-Iron carbide phase diagram, indicate the temperature range of the following heat treatment and mention relative cooling rates : [6]
  - (*i*) Full Annealing
  - (*ii*) Normalising
  - (iii) Hardening
  - (iv) Process annealing
  - (v) Nitriding
  - (vi) Carburising.
  - (b) Differentiate between Martempering and Austempering. [4]
  - (c) Explain with the help of figure, Widmanstaten structure. [3]

**5.** (a) Explain classification of steels on the basis of composition. [4]

(b) What do you understand by weld decay of austenitic stainless steel ? State the methods of prevention of weld decay.

[2+2=4]

- (c) Prepare a table comparing alloy steels and plain carbon steelson the basis of the following : [4]
  - (*i*) Corrosion resistance
  - (ii) Hardenability
  - (iii) Cost
  - (*iv*) Toughness.

Or

- 6. (a) What will be the AISI equivalent of the following: [2+2=4] (i) C40
  - (*ii*) T80.
  - (b) Explain with a neat sketch heat treatment cycle of high speed steel with proper reasoning. [4]
  - (c) Invar is an alloy containing 64% Iron and 36% Nickel. What is its most notable property ? Stats and justify two applications for which this notable property is most suitable. [2+2=4]
- 7. (a) What is age hardening ? Which alloys can be age hardened ?
  [3+3=6]
  - (b) Give classification of copper alloys. Differentiate between brass and bronze. [2+2=4]
  - (c) Write a short note on bearing materials. [3]

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8. (a) State true or false and justify : [2+2+2=6]

- (1) Aluminium alloys are widely used in aeronautic and automotive applications.
- (2) Tin Bronzes show pronounced coring.
- (3) 60/40 brass can be easily cold worked.
- (b) Name the base metal for the following alloys : [4]
   (i) Duralumin
  - (ii) Gun metal
  - (iii) Berylium bronze
  - (iv) Monel.
- (c) In a photo micrograph of a polycrystalline cartridge brass specimen, regions having relatively straight and parallel sides and, a shade contrast than the surrounding are observed. What can be these regions ?

Can this feature be used to differentiate between 'as cast' and 'cold worked + annealed' conditions of the alloy ? Explain in two sentences. [1+2=3]

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No.	

### [5252]-519

### S.E. (Mechanical/Automobile) (Second Semester) EXAMINATION, 2017 APPLIED THERMODYNAMICS

### (2015 PATTERN)

**Time : Two Hours** 

Maximum Marks : 50

- **N.B.** :- (i) Answer 4 questions out of 8.
  - (ii) Solve Q. 1 or Q. 2, Q. 3 or Q. 4., Q. 5. or Q. 6,
    Q. 7 or Q. 8.
  - (*iii*) All the *four* questions should be solved in one answer book and attach extra supplements if required.
  - (iv) Draw diagrams wherever necessary.
  - (v) Use of scientific calculator is allowed.
  - (vi) Assume suitable data wherever necessary.
- 1. (a) Explain the phenomenon of Dissociation and show its effects on Otto cycle. [6]
  - (b) Describe stages of combustion in SI engine with the help of P-θ diagram.
     [6]

#### Or

- (a) Draw and explain valve timing diagram for 4-stroke petrol engine.
   [6]
  - (b) Explain the simple carburetor with neat sketch. List out the limitations of simple carburetor. [6]
- **3.** (a) Explain briefly different variables which affect knocking in C.I. engine. [6]

(b)During trial on single cylinder 4-S oil engine, the following results were obtained : [6] Cylinder diameter = 20 cm, Stroke = 40 cm Mean effective pressure = 6 bar Torque = 407 N-m, Speed = 250 rpm Oil consumption = 4 kg/hrCalorific value of fuel = 43 MJ/kg Cooling water flow rate = 270 kg/h Rise in cooling water temperature =  $45^{\circ}$ C Temperature of exhaust gases =  $420^{\circ}$ C Room temperature =  $20^{\circ}$ C Air used per kg of fuel = 30 kgMass flow rate of water through exhaust gas calorimeter = 8 kg/minRise in temperature of calorimeter water =  $8^{\circ}C$ Mean specific heat of exhaust gas = 1kJ/kgK Find IP, BP and draw heat balance sheet for the test in kW.

Or

- 4. (a) With the help of neat sketch explain the working of automatic fuel injector. [6]
  - (b) A six cylinder 4S, SI engine running at 4000 rpm. The bore of each cylinder is 100 mm and stroke is 120 mm. The clearance volume of each cylinder is 100 cc. The fuel consumption is 20 kg/hr and torque develop is 150 Nm. Calculate : [6]
    - (i) BP
    - (*ii*) BMEP
    - (iii) Break thermal efficiency,
    - (iv) Relative efficiency based on brake power. Assume calorific value of fuel as 43 MJ/kg.

- **5.** (a) Write short notes on dry sump lubrication system. [6]
  - (b) What is air pollution ? Explain the contributors to air pollution and their harmful effects on human beings. [7]

- 6. (a) What is the cause of NOx generation ? Briefly explain various methods to control Nox. [6]
  - (b) What are the harmful effects of overheating of I.C. engines? Explain any *one* cooling system with schematic sketch. [7]
- 7. (a) What is multistaging in reciprocating air compressor ? Explain its advantages with P-V diagram. [6]
  - (b) A single cylinder, double acting air compressor sucks in air at the rate of 5 m<sup>3</sup>/min at a pressure of 100 kPa and 25°C. It delivers air to the receiver at a pressure of 6 bar. The speed of the compressor is 250 rpm and stroke is 1.5 times cylinder diameter. Neglect the effect of clearance and if law of compression is  $PV^{1.28} = C$ , find :
    - (*i*) Cylinder dimensions
    - (*ii*) Indicated power of the compressor
    - (iii) The shaft power if the mechanical efficiency is 90%. [7]

#### Or

- 8. (a) Explain vane type rotary compressor with neat sketch and P-V diagram. [6]
  - (b) Derive the expression for volumetric efficiency and enlist the various factors affecting volumetric efficiency. [7]

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No.	

### [5252]-520

### S.E. (Mechanical, Mech. Sandwich and Automobile) (Second Semester) EXAMINATION, 2017 ELECTRICAL AND ELECTRONICS ENGINEERING (2015 PATTERN)

### **Time : Two Hours**

### Maximum Marks : 50

- **N.B.** :- (i) Attempt question Nos. 1 or 2, 3 or 4, 5 or 6, 7 or 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.
- (a) Derive expression for torque in a 3-phase induction motor and hence obtain equation for standstill condition. [6]
  - (b) A DC shunt motor has armature resistance of 4 ohm. On full load, it runs at 1600 rpm drawing armature current of 10 A from 200 V dc supply. Find full load torque and starting torque assuming that flux is maintained constant. [7]

### Or

- 2. (a) The power input to a 3-phase induction motor is 60 kW. The net stator losses are 1 kW. Find the total mechanical power developed and rotor copper loss per phase if motor is running with a slip of 3%.
  - (b) Draw a neat sketch of 4 pole DC machine. Label main parts of it. State the function and material used for construction of any four parts.

**3.** (a) Differentiate between a microprocessor and a microcontroller. [6]

- (b) Explain the construction and working of linear induction motor with the help of suitable diagram. Also state its applications.[6]
   Or
- **4.** (a) Write advantages, disadvantages and applications of Brushless DC motor. [6]
  - (b) Draw the block diagram of typical data acquisition system. Write function of each block. [6]
- 5. (a) Explain the various operating modes of timers in ATmega 328P microcontroller. [6]
  - (b) Explain serial communication using Arduino IDE. Also explain the functions Serial.print() and Serial.printin() with example. [6]

#### Or

- 6. (a) Draw the diagram of general purpose Arduino board. [6]
  - (b) Explain the interfacing of LED with Arduino board with required functions and write an algorithm to blink an LED. [6]
- 7. (a) Draw ADMUX register and explain the function of each bit in it. [6]
  - (b) Draw and explain the interfacing diagram of ATmega 328P microcontroller to control operation of DC motor using PWM. [7]
     Or
- 8. (a) Draw the schematic showing ADC Control and explain each bit of Status Register A. [6]
  - (b) Discuss the working of accelerometer and explain the interfacing of ADXL335 Acceloremeter with ATmega 328P microcontroller with diagram.
     [7]

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No.	

### [5252]-521

### S.E (Mechanical Sandwich) (First Semester) EXAMINATION, 2017 MATERIALS SCIENCE AND METALLURGY

#### (2015 COURSE)

**Time : Two Hours** Maximum Marks : 50 *N.B.* :− (i)Answers to the two sections should be written in separate answer book. (ii)Neat diagrams must be drawn wherever necessary. (iii) Figures to the right side indicate full marks. 1. Define Corrosion and classification of Corrosion. (a)[4] (b)Distinguish between Sip and Twin. [4] (c)Define hardness and differentiate Brinell and Rockwell hardness test. [4] Or2. (a)What is NDT ? Explain Radiography Test. [4] Write short note on Points Defects. (b)[4]Define toughness and differentiate between Charpy and Izod (c)Impact Test ? [4] Describe limitation of plain carbon steel. 3. (a)[4] *(b)* Define annealing and types of annealing. [4]Draw Iron Carbon Diagram. (c)[5] Or Draw Isothermal TTT Diagram. [4] 4. (a)Write short note on carburilzing and list its applications. [4] (*b*) (c)Define allotropy and list critical temperature in Iron Carbon Diagram ? [5] P.T.O.

5.	<i>(a)</i>	Define sintering process and explain liquid pha	ase
		sintering.	[4]
	( <i>b</i> )	Distinguish between Brass and Bronze with applications.	[4]
	(c)	List application of Powder Metallurgy.	[4]
		Or	
6.	<i>(a)</i>	Describe the steps involved in powder metallurgy.	[4]
	( <i>b</i> )	Write a short note on Bearing materials.	[4]
	(c)	Explain with properties, application of Aluminium alloys	in
		Industry.	[4]
7.	<i>(a)</i>	Describe classification of Polymers.	[4]
	( <i>b</i> )	List application of Ceramics.	[4]
	(c)	What is composite material and compare it with metal ?	[5]
		Or	
8.	<i>(a)</i>	List mechanical properties of Polymers.	[4]
	( <i>b</i> )	Write a short note on Fiber reinforced composites ?	[4]
	(c)	Compare ceramic material with metal with examples.	[5]

Time : Three Hours

Seat	
No.	

### [5252]-522

## S.E. (Mechanical Sandwich) (First Semester) EXAMINATION, 2017 FLUID MECHANICS AND MACHINERY

### (2015 PATTERN)

Maximum Marks : 50

**N.B.** :- (i) All questions are compulsory.

- (ii) Answers should be written in the same answer-books.
- (iii) Neat diagrams must be drawn wherever necessary.
- (*iv*) Figures to the right indicate full marks.
- (v) Use of log table, slide rule, Mollier charts, electronic calculator and steam table is allowed.
- (vi) Assume suitable data, if necessary.
- **1.** (a) Write a short note on vapour pressure. [4]
  - (b) The velocity distribution of an oil film down an inclined channel is given by :

$$u = \frac{v}{2\mu} \left( d^2 - y^2 \right) \sin \alpha \, .$$

where, d = depth of flow,  $\alpha = \text{channel inclination}$ , u = velocityat a depth "y" below free surface, v = unit weight of oil andu = dynamic viscosity.

Calculate shear stress at free surface, at mid depth and at the bottom of surface. [8]

- 2. (a) Derive the relationship between stream function and velocity potential function. [5]
  - (b) Check the continuity of the following two-dimensional compressible flow if : [7]

$$u = \frac{-x}{x^2 + y^2}, \quad v = \frac{-y}{x^2 + y^2}$$

- **3.** (a) Write a short note on Hydraulic coefficients. [6]
  - (b) State Buckingham's theorem. Why is this theorem used ? Write applications of this theorem. [7]

- 4. (a) A venturimeter installed in a 100 mm diameter pipeline carries oil of specific gravity 0.87. Maximum mercury difference is 50 cm, on a manometer. Determine the maximum throat diameter if it shows full gauge deflection at 20 LPS oil flow. Take  $C_d = 0.984$ . [6]
  - (b) Derive the expression for maximum efficiency of a Pelton Wheel. [7]
- 5. (a) Define degree of reaction. What are approximate values of DOR for various turbines. Would you use a turbine having DOR = 1 ? Write the Formula for DOR. [8]

 $\mathbf{2}$ 

(b) Compare Francis Wheel with Kaplan Wheel. [5]

- 6. (a) State the function of a draft tube. Mention the types of draft tubes used for turbines. Why is draft tube not used in Pelton Wheel ?
   [5]
  - (b) A Kaplan runner has 4.5 m O.D. Its hub diameter is 2 m. It runs at 150 rpm while developing 20.6 MW power under a head of 21 m. If hydraulic and overall efficiencies are 94% and 88% respectively, determine inlet and outlet vane angles at mean diameter.
- 7. (a) Explain Manometric and overall efficiency of a centrifugal pump. [4]
  - (b) Derive an expression for specific speed of a centrifugal pump.

#### Or

- 8. A centrifugal pump runs at 800 rpm with a head of 20.2 m. Impeller
  O.D. and width of a pump are 480 mm and 60 mm respectively.
  If exit vane angle is 40° and manometric efficiency is 70%,
  find : [12]
  - (*i*) Outlet flow velocity
  - (*ii*) Outlet absolute velocity
  - (*iii*) Discharge
  - (*iv*) Specific speed.

### [5252]-522

3

Seat No.

### [5252]-523

### SE (Mechanical Sandwich) (Second Semester) EXAMINATION, 2017 THERMAL ENGINEERING (2015 PATTERN)

- Time : Two Hours
   Maximum Marks : 50

   N.B. :- (i)
   Solve any four questions (Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8).
  - (*ii*) All the four questions should be solved in one answerbook and attach extra supplements if required.
  - (iii) Neat diagrams must be drawn wherever necessary.
  - (iv) Figures to the right side indicate full marks.
  - (v) Use of steam table, Mollier charts, scientific calculator is allowed.
  - (vi) Assume suitable data if necessary

# **1.** (*a*) Compare reciprocating compressor with a rotary compressor. [6]

(b) The temperature limits of an ammonia refrigerating system are  $+25^{\circ}$ C and  $-10^{\circ}$ C. If the gas is dry at the end of compression, calculate the COP of the cycle assuming no undercooling of the liquid ammonia. Use the following table for properties of ammonia : [6]

Tem(°C)	Liquid Heat	Latent Heat	Liquid entropy
	(kJ/kg)	(kJ/kg)	(kJ/kgK)
+25	298.9	1166.94	1.1242
-10	135.37	1297.68	0.5443

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- 2. (a) A single-acting, two stage reciprocating air compressor with complete intercooling delivers 10.5 kg/min of air at 16 bar. The compressor takes in air at 1 bar and 27°C. The compression and expansion follow the law pV<sup>1.3</sup> constant, calculate [6]
  (i) Power required to drive the compressor
  - (*ii*) Isothermal efficiency
  - (iii) Free air deliver
  - (iv) Heat transferred in intercooler
  - (b) How are refrigerants classified ? Explain with examples. What is alternative refrigerant ?
- 3. (a) Explain the working of a turbojet engine with the help of a sketch. What are its advantages, disadvantages and applications ? [6]
  - (b) Explain the governing system of IC engine. [6]
    - Or
- (a) Calculate the required air-fuel ratio in a gas turbine plant, whose turbine and compressor efficiencies are 85 and 80% respectively. Maximum cycle temperature is 875°C. The working fluid can be taken as air (Cp=1.0 kJ/kg.K, γ=1.4), which enters the compressor at 1 bar and 27°C. The pressure ratio is 4. The fuel used has calorific value of 42000 kJ/kg, There is loss of 10% of calorific value in combustion chamber. [6]
  - (b) What are various methods of turbocharging ? Compare their relative merits. [6]

[5252]-523

- (a) An engine uses 6.5 kg of oil per hour of calorific value 30,000 kJ/kg. If the B.P. of the engine is 22 kW and mechanical efficiency 85%, calculate : [6]
  - (i) Indicated thermal efficiency
  - (*ii*) Brake thermal efficiency
  - (iii) Specific fuel consumption in kg/B.P./h.
  - (b) Define volumetric efficiency for an I.C. engine. What is the effect of volumetric efficiency on :
    - (i) engine power
    - (*ii*) Specific fuel consumption. [7]

- 6. (a) Define the following : [6]
  - (i) Mechanical efficiency
  - (*ii*) Overall efficiency
  - (iii) Indicated thermal efficiency
  - (b) What is the use of heat balance sheet of an engine ? Mention the various items to be determined to complete the heat balance sheet.
- 7. (a) Explain the following [6]
  - (*i*) Pre-ignition
  - (ii) Cetane number
  - (b) Describe with neat sketch catalytic converter system. [7] Or
- 8. (a) Explain with neat sketch the stages of combustion in S.I. engine. [6]
  - (b) Write short notes on
    - (*i*) Ignition delay and factors affecting delay period.
    - (*ii*) Emissions from S.I. and C.I. engines and their harmful effects.

[7]

Seat	
No.	

### [5252]-524

### S.E. (Mechanical Sandwich)(Second Semester) EXAMINATION, 2017 METROLOGY AND QUALITY CONTROL (2015 PATTERN)

### **Time : Two Hours**

### Maximum Marks : 50

- **N.B.** :— (i) Neat diagrams must be drawn wherever necessary.
  - (ii) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4,
    Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (*iii*) Assume suitable data, if necessary.
  - (iv) Use of non-programmable calculator is allowed.
  - (v) Figures to the right indicate full marks.
- 1. (a) List different types of linear and angular measuring instruments and explain any *one* in detail. [6]
  - (b) Solve any one :
    - (i) Explain different types of fits with example. Explain concept of deviations (Fundamental, Upper and Lower) through a diagram.

#### Or

(*ii*) Find the shaft and hole dimensions with tolerance for a 90H8e9 pair given the following data with standard notations - 90 mm lies in diameter step of 80 to 100 mm. Upper deviation for e shaft =  $-11D^{0.41}$ , Tolerance unit,  $i = 0.45(D)^{0.33} + 0.001D$ . Also, find the types of fit produced. [6]

2.	<i>(a)</i>	Explain Centre Line Average (CLA) method of analyzing the
		surface trace. [6]
	( <i>b</i> )	Explain the term Calibration. [2]
	(c)	Explain (any one) - LVDT comparator OR Johanson Mikrokator.
		[4]
3.	<i>(a)</i>	Write a note on Various types of screw thread errors. [6]
	( <i>b</i> )	State 7 Basic Quality tools and explain any one from them
		in detail. [6]
		Or
4.	<i>(a)</i>	List and explain various categories of Cost of Quality. [3]
	( <i>b</i> )	Write a note on Quality Circle [4]
	( <i>c</i> )	Explain with a sketch - Profile Projector. [5]
5.	( <i>a</i> )	What is TPM ? Explain eight pillars of TPM. [6]
	( <i>b</i> )	Write a note on Production Part Approval Method (PPAM).
		[4]
	( <i>c</i> )	Explain the concept of Process Capability. [3]
		Or
6.	( <i>a</i> )	Compare 100% Inspection versus Sampling Inspection. [7]
	( <i>b</i> )	Explain (any one) :
		(i) 5S
		(ii) Poka-yoke
		( <i>iii</i> ) Kaizan. [6]
7.	( <i>a</i> )	Table below shows the number of defectives found in inspection
		of 10 lots of 100 magnets each

Lot No.	1	2	3	4	5	6	7	8	9	10
No. of Defectives	3	2	5	2	1	4	4	13	4	3

- (i) Determine the control limits for P chart and state whether the process is in control.
- (ii) If the point that goes outside the control limits is analyzed and eliminated, what will be the value of new control limit?
- (b) Write a detailed note on (any one) : [7]
  - (*i*) ISO-9000 *Or*
  - (ii) TS 16949 quality system standards.

- 8. (a) Write notes on (any two): [7]
  - (*i*) FMECA
  - (*ii*) Zero Defect
  - (iii) Fault tree Analysis.
  - (b) Explain/Solve (any one) :
    - (*i*) Comparison of Single, Double and Multiple Sampling plan
    - (ii) Various types of Control Charts and their uses (applications).
    - (*iii*) Calculate sample size and AOQ for Single Sampling Plan using the following data :
      Probability of acceptance of 0.4% defectives in a lot = 0.558, Lot size = 10000, Acceptance number = 1, np' for sample = 1.5. Defectives found in the sample are not to be replaced. If defectives found in sample are to be replaced, then what will be AOQ?

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No.	

### [5252]-525

# S.E. (Mech-Sw) (First Semester) EXAMINATION, 2017 MANUFACTURING ENGINEERING

### (2015 **PATTERN**)

Time : Two Hours

Maximum Marks : 50

**Instructions** :

- (i) Solve Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q.
  7 or Q. 8.
- (*ii*) Figures to the right indicate full marks.
- (iii) Neat duagrams must be drawn wherever necessary.
- (iv) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- (v) Assume suitable data, if necessary.
- 1. (a) Explain various types of cores in casting. [6]
  - (b) Explain continuous casting with neat sketch. [6]

Or

- 2. (a) Explain with neat sketch Rotary swaging process. [6]
  - (b) Determine force required for blanking a square plate having its side 50 mm and have a central hole of diameter 12 mm. The sheet metal thickness is 3 mm and shear strength of material is 380 N/mm<sup>2</sup>. Show die and punch dimensions. Consider clearance of 10% of stock thickness. [6]

- **3.** (*a*) Explain principle, working and advantages of MIG welding with sketch. [6]
  - (b) Explain spot, seam welding process. [6]

- 4. (a) List various attachments of lathe machine and explain any two with neat sketches. [6]
  - (b) Draw merchant force circle and only state relation between these forces. (Do not derive force relation). [6]
- 5. (a) Calculate the time required to drill a hole of 25 mm diameter in a gray cast iron work piece of 75 mm thick using a high speed steel drill. The cutting speed and feed rate for the operation may be assumed to be 0.50 m/s and 0.5 mm/rev. of the drill respectively. [7]
  - (b) Explain up milling and down milling operations. [6]

6. (a) What is indexing ? Explain compound indexing method.

[7]

- (b) Explain the meaning of grinding wheel signature : 26 - C - 60 - M - 7 - V - 28 [6]
- (a) Compare Non-conventional machining processes on the basis of power source, type of material to be machined, shape and accuracy etc.
   [7]
  - (b) Explain the LBM process with neat sketch. [6]

[5252]-525

 $\mathbf{2}$ 

- Or
- 8. (a) A hole is required to be made in a tungsten carbide sheet,
  6 mm thick using USM with abrasive slurry consisting of one part of 320 grit (15 micron radius) boron carbide mixed with 1¼ parts of water. Calculate the drilling time if static stress developed in the tool is 1.4 × 10<sup>2</sup> kg/cm<sup>2</sup>, amplitude of tool vibration is 0.025 mm, operating frequency of the machine is 20,000 cps, compression fracture strength of tungsten carbide is 225 kg/mm<sup>2</sup>, only 1 pulse out of 10 is effective. [7]
  (b) Explain with neat sketch AJM and state its advantages and
  - (b) Explain with neat sketch AJM and state its advantages and limitations. [6]
| Seat |  |
|------|--|
| No.  |  |

## [5252]-526

## S.E. (Mech. Sand.) (Second Semester) EXAMINATION, 2017 THEORY OF MACHINES

#### (2015 **PATTERN**)

**Time : Two Hours** 

Maximum Marks : 50

- N.B. :- (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q 6. Q. 7 or Q 8.
  - (ii) Neat diagrams must be drawn whenever necessary.
  - (iii) Figures to the right indicate full marks.
  - (iv) Use of calculator is allowed.
  - (v) Assume suitable data whenever necessary.
- 1. (a) Write only a classification of kinematic pairs giving example of each of them. [4]
  - (b) Draw a kinematic diagram of figure.1 (a-b). Also identifies the links and compute degree of freedom.
     [6]



Figure.1 (a) Shear Press

(b) Can Crusher

- 2. A small flywheel of mass 85 kg is suspended in a vertical (a)plane as a compound pendulum. The distance of centre of gravity from the knife edge support is 100 mm and the flywheel makes 100 oscillations in 145 seconds. Find the moment of inertia of the flywheel through the centre of gravity. [4] The connecting rod of a diesel engine weighs 556 N, the distance (*b*) between the bearing centers is 90 cm and the diameter of the crank pin bearing 13 cm and that of the wrist pin bearing is 7.0 cm. When suspended vertically on a knife-edge through the crank pin bearing, it performs 61 oscillations in 100 s and with knife-edge through the wrist pin bearing, it makes 55 oscillations in the same time interval. Determine the moment
  - of inertia about the axis through the centre of gravity (Note that the position of C.G. is unknown). [6]
- (a) A multi-disc clutch has three discs on the driving shaft the outside radius of the contact surfaces is 120 mm and inside radius 60 mm. Assuming uniform wear and coefficient of friction as 0.3, find the maximum axial intensity of pressure between the discs for transmitting 25 kW at 1575 rpm. [4]
  - (b) Two shafts are connected by a Hooke's joint. The driving shaft revolves uniformly at 500 r.p.m. If the total permissible variation in speed of the driven shaft is not to exceed ±6% of the mean speed, find the greatest permissible angle between the centre lines of the shafts.

- 4. For an 1C engine mechanism the crank radius is 90 mm and connecting rod length is 450 mm. The crank is rotating in anticlockwise direction with the angular velocity of 15 rad/s and angular acceleration of 100 rad/s<sup>2</sup>. Find the acceleration of the piston and angular acceleration of the connecting rod. When the crank is at 60° from the inner dead centre. Use complex algebra method. [10]
- **5.** (a) The dimensions and configuration of the four bar mechanism, shown in Fig. 2, are as follows :



Figure.2 Four Bar mechanism

 $P_1A = 300 \text{ mm}; P_2B = 360 \text{ mm}; AB = 360 \text{ mm}, \text{ and}$  $P_1P_2 = 600 \text{ mm}.$ 

The angle  $AP_1P_2 = 60^\circ$ . The crank  $P_1A$  has an angular velocity of 10 rad/s and an angular acceleration of 30 rad/s<sup>2</sup>, both clockwise. Determine the angular velocities and angular accelerations of  $P_2B$ , and AB and the velocity and acceleration of the joint B. Use relative velocity and acceleration method. [12]

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(b) Explain with the help of a neat sketch, the space centrode and body centrode. [3]

Or

6. Fig.3 shows a Whitworth quick return motion mechanism. The various dimensions in the mechanism are as follows : [15]



Figure. 3 : Whitworth quick return motion mechanism OQ = 100 mm; OA = 200 mm; QC = 150 mm; and CD = 500 mm.

The crank OA makes an angle of 60° with the vertical and rotates at 120 r.p.m. in the clockwise direction. Locate all the instantaneous centres and find the velocity of ram D.

7. The kinematic diagram of one of the cylinders of a rotary engine is shown in Fig.4. The crank OA which is vertical and fixed, is 50 mm long. The length of the connecting rod AB is 125 mm. The line of the stroke OB is inclined at 50° to the vertical. The cylinders are rotating at a uniform speed of 300 r.p.m., in a clockwise direction,

about the fixed centre O. Draw velocity and acceleration polygon also determine : [15]

- (i) acceleration of the piston inside the cylinder, and
- (*ii*) angular acceleration of the connecting rod.



Figure. 4 : Cylinder of a rotary engine
Or

- 8. (a) In an I.C. mechanism, the stroke length is 40 cm and the obliquity ratio is 4. The angular acceleration of the connecting rod is found to be 54 rad/s<sup>2</sup>, when the crank makes an angle of 45° with the IDC, while rotating at a uniform speed. Determine :
  - (i) The crank speed of RPM
  - (ii) The acceleration of the piston
  - (*iii*) The velocity of acceleration of the mid-point of the connecting rod. Use Klien's construction method. [12]
  - (b) What is Coriolis acceleration ? [3]

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## [5252]-531

# S.E. (E&TC/Electronics) (First Semester) EXAMINATION, 2017 SIGNALS AND SYSTEMS

#### (2015 **PATTERN**)

#### **Time : Three Hours**

#### Maximum Marks : 50

- **N.B.** :— (i) Neat diagrams must be drawn wherver necessary.
  - (ii) Figures to the right indicate full marks.
  - (*iii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (iv) Assume suitable data, if necessary.
- 1. (a) Sketch the following signals : [6] (i) u[n + 2] - u[n - 3]
  - (*ii*)  $r(t) \ u(2 t)$ .
  - (a) Find the convolution of x(t) and h(t): [6] x(t) = u(t + 1)h(t) = u(t - 2).

#### Or

2. (a) Check whether the following system is static/dynamic, linear/ non-linear, causal/non-causal, time variant/time invariant : [4]

$$y(t) = 10x(t) + 5.$$

(b) Check whether the following signal is periodic or non-periodic. If periodic, find the fundamental time period [2]  $x(t) = 2 \cos (10t + 1) - \sin (4t - 1)$ 

- (c) Determine the convolution sum of two sequences graphically : [6]  $x[n] = \{1, 2, 3, 2\}$   $h[n] = \{1, 2, 2\}$  $\uparrow$   $\uparrow$
- **3.** (a) Find the trigonometric Fourier series for the periodic signal x(t). [6]



(b) Obtain the Fourier transform of a rectangular pulse : x(t) = A rect (t/T). [6] Or

4. (a) Obtain the exponential Fourier series of the unit impulse train

$$x(t) = \sum_{k=-\infty}^{\infty} \delta(t - kT_0)$$

Sketch the Fourier spectrum. [6]

- (b) Find the Fourier transform of the following signals : [6]
  - (*i*)  $x(t) = \delta(t)$
  - (*ii*)  $x(t) = e^{-at} u(t)$ .

5. (a) Find the Laplace transform of :

$$x(t) = e^{-5t} [u(t) - u(t - 5)]$$
 and its ROC [7]

(b) Find the initial and final values for the following function : [6]

$$x(s) = \frac{s+5}{s^2+3s+2}$$
  
Or

6. (a) Determine the inverse Laplace Transform of : [7]

$$x(s) = \frac{2}{s(s+1)(s+2)}$$



- 7. (a) In a random experiment, a trial consists of four successive tosses of a coin. If we define a random variable x as the number of heads appearing in a trial, determine PDF and CDF.
  - (a) State and prove any *three* properties of PDF. [6]

Or

8. (a) A certain random varibale has the CDF given by : [7]

$$F_{x}(x) = 0 \text{ for } x \leq 0$$

$$= kx^{2} \text{ for } 0 < x \leq 10$$

$$= 100k \text{ for } x > 10.$$
Find the values of :
(i) k
(ii)  $P(x \leq 5)$ 
(iii)  $P(5 < x \leq 7)$ 
(iv) Plot the corresponding PDF.
(b) State and explain the properties of auto-correlation function for energy singal.
[6]

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## [5252]-532

## S.E. (Electronics/E&TC) (First Semester) EXAMINATION, 2017 ELECTRONIC DEVICES AND CIRCUITS (2015 PATTERN)

#### Time : Two Hours

## Maximum Marks : 50

- N.B. :- (i) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 and Q. No. 7 or Q. No. 8.
  - (*ii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables are allowed.
  - (iii) Assume suitable data, if necessary.
  - (*iv*) Neat diagrams must be drawn wherever necessary.
  - (v) Figures to the right indicate full marks.

#### 1. (a) Define the following terms w.r.t. JFET : [6]

- (*i*) Pinch-off voltage  $(V_p)$
- (*ii*) Cut-off voltage  $(V_{GS(OFF)})$
- (iii) Forward Transconductance (9 m)
- (b) Calculate  $I_D$  and  $V_{DS}$  for the circuit shown in Fig. 1. MOSFET parameters are  $V_T = 1 V$ ,  $K = 0.1 mA/V^2$ . [6]



- Or
- **2.** (a) Draw and explain frequency response of JFET CS amplifier. [6]
  - (b) Explain the following non-ideal I-V characteristics of MOSFET : [6]
    - (*i*) Body effect
    - (ii) Sub-threshold conduction
    - (*iii*) Breakdown effects.
- (a) Draw and explain high frequency equivalent circuit of MOSFET.
   [6]
  - (b) Explain working of MOSFET as a diode. [6]

#### Or

- 4. (a) Explain working of MOSFET as a switch in VLSI circuits. [6]
  - (b) Determine the small signal voltage gain, input and output resistance of a CS amplifier shown in Fig. 2. MOSFET parameters are  $V_T = 1.5 V, K_n = 0.8 mA/V^2, \lambda = 0.01 V^{-1}.$  [6]



Fig. 2

- 5. (a) Draw and explain RC phase shift oscillator using FET. State its advantages. [7]
  - (b) An amplifier has a midband gain of 125 and bandwidth of 250 kHz. [6]
    - (*i*) If 4% negative feedback is introduced, find the new bandwidth and gain
    - (*ii*) If the bandwidth is to restricted to 1 MHz, find the feedback ratio.

#### Or

- 6. (a) Explain the effect of negative feedback on : [8]
  - (*i*) Gain stability
  - (ii) Amplitude distrotion
  - (*iii*) Frequency distortion
  - (*iv*) Noise.
  - (b) In a Colpitt's oscillator using FET,  $C_1 = 100$  pF,  $C_2 = 7500$  pF. If the frequency of oscillations is to vary between 950 kHz and 2050 kHz, determine the range of inductor values. [5]
- 7. (a) Draw and explain principle of current boosting in 3-terminal adjustable voltage regulator. [7]
  - (b) Determine the range over which the output voltage can be varied in LM 317 voltage regulator if value of  $R_1 = 240 \Omega$  and  $R_2$  is taken as 4.7  $\Omega$  potentiometer. Assume  $I_{adi} = 100 \mu A.$  [6]

#### Or

- 8. (a) Compare between linear power supply and switch made power supply. [6]
  - (b) Write short note on 'Low Dropout Voltage Regulator'. [7]

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**Time : Two Hours** 

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No.	

## [5252]-533

# S.E. (E & TC and Electronics) (I Semester) EXAMINATION, 2017 ELECTRICAL CIRCUITS AND MACHINES

#### (2015 **PATTERN**)

#### Maximum Marks : 50

**N.B.** :- (i) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.

- (ii) Figures to the right indicate full marks.
- (iii) Neat diagrams must be drawn wherever necessary.
- (iv) Use of non-programmable electronic pocket culculator is allowed.
- (v) Assume suitable data if necessary.
- 1. (a) Using superposition theorem, calculate current 'i' for the circuit shown in the following fig. [6]



- (b) Derive the e.m.f. equation of a single phase transformer. [6] Or
- 2. (a) The equivalent circuit of 20 kVA, 2500 V/250 V, 50 Hz. single phase transformer gave the following test results : [6] O.C. Test (L.V. Side) : 250 V, 1.4 A, 105 W
  S.C. Test (H.V. Side) : 104 V, 8 A, 320 W
  Calculate the parameters of approximate equivalent circuit.

(b) State and explain Thevenin's theorem and Norton's theorem.[6]

(a) A 200V, 4 pole, lap wound, d.c. shunt motor has 800 conductors on its armature. The resistance of the armature winding is  $0.5 \Omega$  and that of shunt field winding is 200  $\Omega$ . The motor takes a current of 21 A, the flux per pole is 30 mWb. Find the speed and the gross torque developed in the motor. [6]

(b) Obtain the condition for maximum torque for 3 phase induction motor. State the equation for maximum torque. [6]

#### Or

- (a) The power input to the rotor of a 400 V, 50 Hz, 6 pole, three-phase induction motor is 75 kW. Motor has 2 kW stator losses and mechanical losses 750 watts. If frequency of e.m.f. induced in the rotor circuit has 4 Hz, determine :
  - (i) Slip of the motor
  - (*ii*) Rotor speed
  - (iii) Rotor copper loss per phase
  - (*iv*) Output of the motor
  - (v) Input of the motor
  - (vi) Efficiency of motor.
  - (b) Draw and explain the characteristics of d.c. series motor.[6]

[6]

- **5.** (*a*) What are universal motors ? Explain torque-speed characteristic of compensated type and non-compensated type universal motor.[7]
  - (b) Distinguish between brushless DC motor and Conventional DC motor.[6]

Or

- 6. (a) Explain construction, principle and applications of Reluctance motor. [7]
  - (b) What are brushless motors and explain with neat diagram operation of unipolar brushless DC motor. [6]

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3.

- 7. (a) Compare Variable Reluctance and Permanent Magnet stepper motors. [7]
  - (b) Explain the working and features of armature controlled d.c. servomotor. [6]

Or

- 8. (a) Explain the principle of operation of shaded pole induction motor along with the torque-slip characteristics and state its applications. [7]
  - (b) What are stepper motors ? Explain any one type in detail.[6]

[Total No. of Printed Pages-3]

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## [5252]-534

## S.E (E&TC/Electronics) (I Semester) EXAMINATION, 2017 DATA STRUCTURES AND ALGORITHMS (2015 PATTERN)

#### Time : Two Hours

#### Maximum Marks : 50

- **N.B.** :- (i) Neat diagram must be drawn wherever necessary.
  - (*ii*) Figures to the right indicate full marks.
  - (*iii*) Use of non-programmable electronic pocket calculator is allowed.
  - (*iv*) Assume suitable data, if necessary.
- 1. (a) What do you mean by recursive function ? Explain with suitable example. [6]
  - (b) Write a C function for insertion sort to sort integer numbers.[6]
- 2. (a) Explain with suitable examples, how do you pass structure variable to a function. [6]
  - (b) What is pointer ? What are the advantages using pointer ?Explain pointer declaration and its initialization with an example.[6]
- **3.** (a) Differentiate between SLL and DLL. [4]
  - (b) Write PUSH function to implement stack using array. [4]
  - (c) Name types of queues. Explain any one in detail. [4]

#### Or

4.	( <i>a</i> )	Write short notes on :	[6]
		( <i>i</i> ) Circular Linked List.	

(*ii*) Doubly Link List.

- (b) What is queue ? Explain its implementation using any one method. [6]
- 5. (a) Using the following data, draw a Binary Search Tree. Show all steps. [4]
  10 60 40 28 14 50 5
  - (b) Write a C function to search element in Binary Search Tree.[4]
  - (c) Define the following terms :
    - (*i*) Root
    - (*ii*) Subtree
    - (iii) Level of Node
    - (*iv*) Dept of Tree
    - (v) Siblings
    - (vi) Height of tree

#### Or

- 6. (a) Define Binary Tree. What are its types ? Explain with suitable figures. [4]
  - (b) Write inorder, preorder and postorder traversals for the following tree.



- (c) Explain algorithm to Insert an element in BST. [4]
- 7. (a) Explain Dijkstar's algorithm with example. [7]
  - (b) What do you mean by spanning tree of a graph ? Find minimal spanning tree of the following graph using Kruskal's algorithm.[6]



- Or
- 8. (a) Define the term Graph. With the help of suitable example give adjacency matrix representation and adjacency list representation of a graph. [7]
  - (b) Define DSF and BSF terms of graph with example. [6]

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# [5252]-535

## S.E. (E&TC/Electronics) (First Semester) EXAMINATION, 2017 DIGITAL ELECTRONICS

#### (2015 PATTRN)

Time	e : T	vo Hours	Maximum Marks : 50
<i>N.B</i> .	: (	E) Solve Q. No. 1 or Q. No.	2; Q. No. 3 or Q. No. 4;
		Q. No. 5 or Q. No. 6 and	Q. No. 7 or Q. No. 8.
	( <i>i</i>	i) Neat diagrams must be drav	vn wherever necessary.
	(ii	i) Figures to the right indicate	full marks.
	(i)	) Use of logarithmic tables, slide	rule, Mollier charts, electronic,
		pocket calculator and steam	tables is alowed.
	(;	) Assume suitable data, if nec	essary.
1.	( <i>a</i> )	Design full adder using logic ga	ates. [4]
	( <i>b</i> )	Minimize the following expression	using K-map and implement
		using logic gates :	
		$Y = \Sigma m(1, 3, 5, 9, 11, 13)$	[4]
	(c)	Write a short note on one-bit	memory cell. [4]
2.	( <i>a</i> )	Desogn 3-bit binary to gray coo	de converter [6]
	( <i>b</i> )	Draw and explain 4-bit Ring co	unter [6]
3.	( <i>a</i> )	Draw and explain the working of	f 2-input CMOS NAND gate.
			[6]

(b) Explain state diagram and state table with suitable example.

Explain the following characteristics of digital IC's :

[6]

[6]

		(i) Fan in	
		(ii) Fan out	
		(iii) Propagation delay.	
	( <i>b</i> )	Write short note on state reduction with suitable example	. [6]
5.	<i>(a)</i>	Explain in detail the architecture of PLA.	[6]
	( <i>b</i> )	Implement the following functions using PLA :	[4]
		$F1 = \Sigma m (1, 3, 5, 7)$	
		$F2 = \Sigma m (0, 2, 4, 6).$	
	( <i>c</i> )	List out advantages of semiconductor memories.	[3]
6.	( <i>a</i> )	Draw circuit of one-cell of static and explain its worki	ng.
	( <b>1</b> )		[6]
	(6)	Differentiate between ROM and RAM.	[4]
	( <i>c</i> )	State advantages of PLD over fixed function IC.	[3]
7.	<i>(a)</i>	Draw and explain interrupt register in detail of 8051.	[6]
	( <i>b</i> )	Differentiate microprocessor and microcontroller.	[4]
	( <i>c</i> )	List advantages of microcontroller.	[3]
8.	(a)	Draw and explain block diagram of microcontroller.	[6]
	( <i>b</i> )	Explain the use of program counter.	[4]
	(c)	Explain ACALL instruction.	[3]

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*(a)* 

**4**.

**Time : Two Hours** 

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## [5252]-536

## S.E. (E&TC/Electronics) (Second Semester) EXAMINATION, 2017 INTEGRATED CIRCUITS

#### (2015 **PATTERN**)

Maximum Marks : 50

- $N.B. := (i) \text{ Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and Q. 7 or Q. 8.$ 
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right side indicate full marks.
  - (iv) Use of calculator is allowed.
  - (v) Assume suitable data if necessary.
- 1. (a) Justify, how constant current source is used in place of  $R_E$  to improve CMRR for differential amplifier. [6]
  - (b) Draw neat circuit diagram of three Op-amp Instrumentation amplifier and derive its output equation. [6]

#### Or

**2.** (a) An emitter biased Dual input balanced output differential amplifier has the following specifications :

- (1) Voltage Gain (Ad)
- (2) Input Resistance (Ri)
- (3) Output Resistance (Ro).

- (b) Draw the circuit diagram of Practical differentiator along with frequency response and explain its operation. [6]
- (a) Explain with a neat circuit diagram working of inverting precession full wave rectifier with its waveform. [6]
  - (b) With neat circuit diagram, explain voltage to current converter with grounded load.[6]

#### Or

- 4. (a) Draw and explain circuit of Sample and Hold circuit using Op-amp with its waveform. [6]
  - (b) The output of 8-bit ADC with all 1's when  $V_i = 5$  V, find its :
    - (1) Resolution
    - (2) Digital output code, If  $V_i = 1.7$  V. [6]
- 5. (a) Define the term "Lock range", "Capture range" and "Free running frequency" and explain transfer characteristics of PLL.
   [7]
  - (b) Design a first order low pass filter with higher cut-off frequency of 1 kHz with pass gain '2'. Draw the designed circuit diagram. Assume C = 0.1  $\mu_f$  and  $R_f$  = 10 k $\Omega$ . [6]

6. (a) With the help of neat circuit diagram explain the operation of Wien bridge oscillator. [6]

- (b) Design a wide bandpass filter having  $f_L = 400$  Hz,  $f_H = 2$  kHz and pass band 4. Also calculate the bandwidth. [7] Assume : C' = 0.01 µf and C = 0.05 µf  $R_1' = 10$  k $\Omega$  and  $R_1 = 10$  k $\Omega$
- 7. (a) Calculate output frequency  $f_0$ , Lock range  $\Delta f_L$ , Capture range  $\Delta f_C$  of a PLL, If  $R_T = 1 \ k\Omega$ ,  $C_T = 0.1 \ \mu f$ , filter capacitor  $C = 1 \ \mu f$  and internal resistance = 3.6 k $\Omega$ . Assume  $\pm V = 10V$ .
  - (b) Design all pass filters with a phase shift of  $-135^{\circ}$ . At a frequency of 2 kHz at the output. Draw detailed designed circuit diagram. Assume C = 0.1 µf and R<sub>1</sub> = 10 kΩ. [7] Or

[6]

- 8. (a) Write short notes on application of PLL : [6]
  - (1) Frequency Multiplier
  - (2) FM Demodulator.
  - (b) Design a first order high pass filter with higher cut-off frequency of 10 kHz with pass gain '1.5'. Draw the designed circuit diagram. Assume C = 0.01  $\mu f$  and R<sub>1</sub> = 10 k\Omega. [7]

Seat	
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# S.E. (Ele./E&TC Engg.) (Second Semester) EXAMINATION, 2017 CONTROL SYSTEMS

### (2015 PATTERN)

#### Time : Two Hours

#### Maximum Marks : 50

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- **N.B.** :- (i) Neat diagrams must be drawn wherever necessary.
  - (*ii*) Figures to the right indicate full marks.
  - (*iii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (iv) Assume suitable data, if necessary.
- 1. (A) Obtain the transfer function of system represented by the signal flow graph shown in Figure 1. [6]





(B) For the system with closed loop transfer function

$$\mathbf{G}(s) = \frac{9}{s^2 + 4s + 9}$$

determine damping factor, undamped natural frequency, rise time, peak time, peak overshoot and settling time with 2% tolerance band. [6]

2. (A) Obtain the transfer function  $\frac{V_0(s)}{V_{in}(s)}$  for the system shown in Figure 2. [6]





(B) For the unity feedback system with open loop transfer function  $G(s) = \frac{50 (s + 5)}{s(s^2 + 5s + 50)}, \text{ determine static error constants and}$ steady state error if input is r(t) = 1 + 5t. [6]

# **3.** (A) Investigate the stability of a system having closed loop characteristic equation :

$$\mathbf{Q}(s) = s^4 + 5s^3 + 7s^2 + 3s + 2$$

using Routh stability criterion. Also find number of closed loop poles in the right half of *s*-plane. [4]

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 $\mathbf{2}$ 

(B) For the unity feedback system with open loop transfer function

$$G(s) = \frac{50}{s(s+2)(s+10)}$$
, sketch Bode plot.

Determine gain crossover frequency, phase crossover frequency, gain margin and phase margin. Also investigate the stability. [8]

 (A) Determine damping factor, undamped natural frequency, resonant peak and resonant frequency for the system with closed loop transfer function [4]

$$G(s) = \frac{36}{s^2 + 6s + 36}$$

- (B) Sketch root locus of a system with open loop transfer function  $G(s)H(s) = \frac{k}{s(s+2)(s+8)}.$ [8]
- 5. (A) Obtain controllable canonical and observable canonical state models for the system with transfer function [6]

$$G(s) = \frac{s^2 + 7s + 2}{s^3 + 9s^2 + 2s + 3}$$

(B) Investigate for complete state controllability and state observability of system with state space model matrices [7]

$$\mathbf{A} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -4 & -5 & -7 \end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \quad \mathbf{C} = \begin{bmatrix} 1 & 2 & 1 \end{bmatrix}$$

6. (A) Determine the state transition matrix of system with state equation [7]

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -8 & -6 \end{bmatrix} x$$

(B) Derive the formula for obtaining transfer function from state model and use it to find transfer function of a system with state model.

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -4 & -7 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 2 & 3 \end{bmatrix} x.$$
[6]

(A) Determine pulse transfer function of a system shown in figure3, using first principle (Starred Laplace transform). [7]



(B) Write a short note on PID controller. [6] Or

8. (A) Determine pulse transfer function, impulse response and step response of a system shown in figure. 4 [7]



Fig. 4

(B) Draw and explain block diagram of PLC. [6] [5252]-537 4

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## [5252]-538

### S.E. (Electronics/ETC)(Second Semester)

#### EXAMINATION, 2017

#### ANALOG COMMUNICATION

#### (2015 PATTERN)

#### Time : Two Hours

# N.B. :- (i) Solve Q. No. 1 or Q. No. 2; Q. No. 3 or Q. No. 4; Q. No. 5 or Q. No. 6 and Q. No. 7 or Q. No. 8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (*iii*) Figures to the right indicate full marks.
- (*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic, pocket calculator and steam tables is alowed.
- (v) Assume suitable data, if necessary.
- (a) What is modulation ? Explain need of modulation and its types.
  - (b) State and compare different SSB generation methods. [6] Or
- **2.** (a) Discuss the Direct Method of FM generation. [6]
  - (b) What are the significant changes done in superheterodyne receiver over TRF Receiver ? [6]

#### P.T.O.

#### **Maximum Marks : 50**

- 3. (a) What is double spotting and image frequency rejection ratio in radio receiver ? [6]
  - (b) Derive the expression for FM Modulated wave for sinusoidal modulating signal [6]

 $e = A \sin \theta$ .

#### Or

- **4.** (*a*) State the significance of Pre-emphasis and de-emphasis in FM. [6]
  - (b) How integrated circuit helps to detect FM Signal ? [6]
- **5.** (a) Define Noise and explain various sources of Noise. [7]
  - (b) Discuss the behaviour of baseband system in presence of Noise.

#### Or

- 6. (a) Consider a radio receiver with RF amplifier having noise figure
  3 dB and gain of 12dB followed by a mixer with noise figure
  12 dB and conversion gain 20 dB. Calculate overall noise figure
  and noise temperature. [6]
  - (b) Discuss the behaviour of amplitude modulated system in presence of Noise. [7]

7. (a) Discuss the role of sampling theorem in digitization of signal.

8. (a) Explain distortion occur in process of sampling and its remedial solutions. [7]

(b) Describe types of sampling with their merits and demerits.

[6]

[6]

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## [5252]-539

Maximum Marks : 50

## S.E. (E&TC/Elect.)(Second Semester) EXAMINATION, 2017 OBJECT ORIENTED PROGRAMMING (2015 PATTERN)

#### **Time : Two Hours**

- *N.B.* :— (*i*) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right side indicate full marks.
  - (iv) Use of calculator is allowed.
  - (v) Assume suitable data if necessary.
- (a) Differentiate between Procedure oriented programming and Object oriented programming. [6]
  - (b) How to create reference variable in C++ ? Explain with example. [6]

#### Or

**2.** (a) Define Inheritance. Explain different types of inheritance.

[3]

(b) How is memory allocated to a class and objects in C++ ?

[3]

- (c) Explain the following terms with example [6]
  - (*i*) Data Encapsulation and Data Abstraction.
  - (ii) Scope Resolution Operator.

(a)	Describe the features of JAVA.	[6]
(b)	Write short notes on :	[7]
(0)	(i) Control Statements in $IAVA$	[,]
	( $i$ ) Control Statements in JAVA.	
	( <i>ii</i> ) Command line Arguments.	
	Or	
<i>(a)</i>	Define Class in JAVA. How are objects created from a class	$\operatorname{ass}?$
		[6]
( <b>b</b> )	What is Recursion ? Write a program to print array elem	ents
	using Recursion.	[7]
( <i>a</i> )	What are Abstract Classes ? Explain with example.	[6]
<i>(b)</i>	Differentiate between Interface and a Class.	[6]
	Or	
(a)	Write short notes on :	[6]
	(i) Object Class	
	(i) Use of final with inheritance	
( <b>1</b> )	(ii) Use of final with finite trance.	[0]
(b)	Explain Package in detail with suitable example.	[6]
(a)	What is Multithreading ? Explain in detail.	[7]
( <b>b</b> )	Explain Byte stream and character stream.	[6]
	Or	
<i>(a)</i>	How to create a simple Applet ? Explain with example	ə. [7]
( <i>b</i> )	Explain the terms :	[6]
( <i>b</i> )	Explain the terms : ( <i>i</i> ) Reading Console inputs.	[6]
	<ul> <li>(a)</li> <li>(b)</li> <li>(a)</li> <li>(b)</li> <li>(a)</li> <li>(b)</li> <li>(a)</li> <li>(b)</li> <li>(a)</li> <li>(b)</li> <li>(a)</li> <li>(b)</li> <li>(a)</li> </ul>	<ul> <li>(a) Describe the features of JAVA.</li> <li>(b) Write short notes on : <ul> <li>(i) Control Statements in JAVA.</li> <li>(ii) Command line Arguments.</li> <li>Or</li> </ul> </li> <li>(a) Define Class in JAVA. How are objects created from a class</li> <li>(b) What is Recursion ? Write a program to print array elem using Recursion.</li> <li>(a) What are Abstract Classes ? Explain with example.</li> <li>(b) Differentiate between Interface and a Class.</li> <li>Or</li> </ul> <li>(a) Write short notes on : <ul> <li>(i) Object Class.</li> <li>(ii) Use of final with inheritance.</li> </ul> </li> <li>(b) Explain Package in detail with suitable example.</li> <li>(c) Explain Byte stream and character stream.</li> <li>Or</li> <li>(a) How to create a simple Applet ? Explain with example</li>

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## S.E. (E&TC/(Electronics Engg.) (Second Semester) EXAMINATION, 2017 ENGINEERING MATHEMATICS-III (2015 PATTERN)

#### **Time : Two Hours**

#### Maximum Marks : 50

- - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (v) Assume suitable data, if necessary.

1. (a) Solve (any two) :  
(i) 
$$(D^2 + 4D + 4)y = \sin 2x$$
  
(ii)  $(D^2 - 6D + 9)y = \frac{e^{3x}}{x^2}$   
(iii)  $x^2 \frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} - 4y = x^2$   
(b) Find  $f(x)$  if  $F_c(\lambda) = e^{-3\lambda}$ ,  $\lambda > 0$ . [4]  
Or

2. (a) A capacitor 10<sup>-3</sup> farad is in series with e.m.f. of 20 volts and an inductor of 0.4 henry, at t = 0, the charge Q and current I are zero, find Q at any time t. [4]
P.T.O.

(b) Find the inverse z-transform (any one) : [4]

(i) 
$$F(z) = \frac{z}{(z-1)(z-4)}, |z| > 4$$

(*ii*) 
$$F(z) = \frac{1}{(z-4)(z-3)}$$
.

(by inversion integral method)

(c) Solve the following difference equation to find 
$$f(k)$$
:  
 $f(k + 2) + 3f(k + 1) + 2f(k) = 0;$   
 $f(0) = 0, f(1) = 2, k \ge 0$ 
[4]

3. (a) Using fourth order Runge-Kutta method, solve the differential equation :  $\frac{dy}{dx} = \frac{1}{x+y}$  with initial condition y(0) = 1. Find y(0.2) taking h = 0.2 [4]

(b) Find Lagrange's interpolating polynomial passing through setof points : [4]

x	2	4	5
у	6	20	30

(c) Find the directional derivative of  $\phi = xy^3 + yz^3$  at the point (2, -1, 1) in the direction of vector  $\bar{i}+2\bar{j}+2\bar{k}$ . [4]

Or

4. (a) Show that (any one): [4]

(i) 
$$\nabla \left[ r \nabla \frac{1}{r^3} \right] = \frac{3}{r^4}$$

(*ii*) 
$$\nabla \left(\frac{\bar{a}.\bar{r}}{r^5}\right) = \frac{\bar{a}}{r^5} - 5 \frac{\left(\bar{a}.\bar{r}\right)\bar{r}}{r^7}$$

(b) Show that :

 $\overline{\mathbf{F}} = (y\sin z - \sin x)\overline{i} + (x\sin z + 2yz)\overline{j} + (xy\cos z + y^2)\overline{k}$ 

is irrotational. Find scalar potential  $\phi$  such that  $\bar{F} = \nabla \varphi \, . \, [4]$ 

(c) Stating the formula for Simpson's 
$$\frac{1}{3}$$
 rd rule, evaluate  $\int_{1}^{1.04} f(x) dx$   
from the following data : [4]  
 $x$  : 1 1.01 1.02 1.03 1.04  
 $f(x)$  : 3.953 4.066 4.182 4.300 4.421

5. (a) Find work done by the force  

$$\overline{F} = (2y+3)\overline{i} + (xz)\overline{j} + (yz-x)\overline{k}$$
 in taking a particle from (0,0,0)  
to (3, 1, 1). [4]

(b) Apply Stokes' theorem to calculate  

$$\int_{c} 4y \, dx + 2z \, dy + 6y \, dz, \text{ where } c \text{ is curve of intersection of}$$

$$x^{2} + y^{2} + z^{2} = 6z \text{ and } z = x + 3.$$
[5]

(c) Show that 
$$\overline{E} = -\nabla \phi - \frac{1}{c} \frac{\partial A}{\partial t}$$
,  $\overline{H} = \nabla \times \overline{A}$  are solutions of the Maxwell's equations : [4]

(*i*) 
$$\nabla \times \overline{\mathbf{H}} = \frac{1}{\mathcal{C}} \frac{\partial \mathbf{E}}{\partial t}$$

—

(*ii*) 
$$\nabla \times \overline{E} = \frac{1}{c} \frac{\partial \overline{H}}{\partial t}$$
, if  
(1)  $\nabla .\overline{A} + \frac{1}{c} \frac{\partial \phi}{\partial t} = 0$   
(2)  $\nabla^2 \overline{A} = \frac{1}{c^2} \frac{\partial^2 \overline{A}}{\partial t^2}$   
*Or*

**6.** (a) Using Green's lemma evaluate  $\int \overline{F} d\overline{r}$ , where :

 $\overline{F} = \sin z \overline{i} + \cos x \overline{j} + \sin y \overline{k} \text{ and } c \text{ is the boundary of rectangle}$  $0 \le x \le \pi, \quad 0 \le y \le 1 \text{ and } z = 3.$ [4]

(b) Use divergence theorem to evaluate  

$$\iint (4xz\overline{i} - y^2\overline{j} + yz\overline{k}).d\overline{s}, \text{ where } s \text{ is the surface of the bounded by the planes}$$

$$x = 0, x = 2, y = 0, y = 2, z = 0, z = 2$$
 [5]

cube

(c) Prove that 
$$\oint_{C} (\vec{a} \times \vec{r}) \cdot d\vec{r} = \iint_{S} 2\vec{a} \cdot d\vec{s}$$
, where  $\vec{a}$  is a constant vector.  
[4]

7. (a) If f(z) = u + iv is analytic and  $u = x^2 - y^2$  find v and then f(z) in terms of z. [4]

- (b) Evaluate  $\int_{C} \cot z \, dz$ , where 'C' is the circle |z| = 4. [4]
- (c) Show that under the transformation  $w = z + \frac{1}{z}$ , family of circles |z| = c are transformed into family of ellipses in *w*-plane. What is the transform if c = 1. [5]
8. (a) If f(z) = u + iv is analytic, show that family of curves u = c, v = b are orthogonal. [4]

(b) Evaluate 
$$\int_{C} \frac{\sin 2z}{\left(z + \frac{\pi}{3}\right)^4} dz$$
, where 'C' is circle  $|z| = 2$ . [4]

(c) Find the bilinear transformation, which maps the points 0, -1, *i* of the z-plane on to the points 2,  $\infty$ ,  $\frac{1}{2}(5+i)$  of the *w*-plane, respectively. [5]

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# [5252]-542

# S.E. (Electrical Engineering) (First Semester) EXAMINATION, 2017 POWER GENERATION TECHNOLOGIES

#### (2015 PATTERN)

#### **Time : Two Hours**

#### Maximum Marks : 50

- **N.B.** :- (i) Attempt all questions.
  - (ii) Figures to the right indicate full marks.
  - (iii) Assume suitable data, if necessary.
- 1. (a) Explain the operation of steam power plant with the help of schematic diagram. [6]
  - (b) Explain rankine cycle with PV and TS Diagram. [6] Or
- (a) Explain working of Electrostatic precipitator with neat sketch.
   [6]
  - (b) With the help of diagram explain the Nuclear power plant. [6]
- **3.** (a) Explain the working of Pelton turbine with neat diagram in hydro power plant [6]
  - (b) Describe the types of wind turbine electrical generators. [7] Or
- 4. (a) Explain the function of the following component in HPP : [6] (1) Dam
  - (2) Penstock.

- (b) Explain how the wind pattern affects power generation in wind energy systems. [7]
- 5. (a) Explain the impacts of shading on PV system I-V curves. [7]
  - (b) Explain the methods of measurement of solar radiation. [6] Or
- 6. (a) Write a short note on Ocean Thermal Energy conversion. [7]
  (b) Explain the terms : [6]
  - (1) Solar Constant
  - (2) Concentration ratio.
- 7. (a) Discuss the working of a paraboloidal collector with neat sketch. [6]
  - (b) Write a short note on biomass energy conversion to electricity. [6]

- 8. (a) Explain flat type solar collector and its application. [6]
  - (b) Explain grid connected renewable system and their requirements. [6]

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### S.E. (Electrical) (First Semester) EXAMINATION, 2017 ANALOG AND DIGITAL ELECTRONICS (2015 PATTERN)

Time : Two Hours Maximum Marks : 50 N.B. :- (i) Attempt Q. 1 or 2, Q. 3 or 4, Q. 5 or 6, Q. 7 or Q. 8. (ii)Figures to the right indicate full marks. Neat diagram must be drawn wherever necessary. (*iii*) (iv)Use of non-programmable calculator is permitted. Use suitable data. (V)1. Perform the following arithmetic operations : [6] (A) (1) Add 72 and 47 BCD numbers (2) Convert  $(1357)_8 = (?)_2 = (?)_{16}$ Convert  $(111011)_2$  to Gray Code **(B)** (1) Encode (2345) in BCD and Excess-3 Code. (2)[6] Or 2. Simplify the following expression using K-map : [6] (A)  $X = \overline{A}\overline{B}\overline{C} + A\overline{C}\overline{D} + A\overline{B} + ABC\overline{D} + \overline{A}\overline{B}C$ Draw and explain Asynchronous Up-Down counter. **(B)** [6] 3. Explain the function of LM 317 as adjustable voltage regulator. [6] (A) **(B)** Explain High pass filter using op-amp with its frequency response. [7]

- 4. (A) Explain working of IC 555 as Monostable Multivibrator. [6]
  (B) Explain operation of Op-amp as sine wave generator. [7]
- 5. (A) Explain the importance of load line. Draw and explain DC load line. [6]
  - (B) Explain operation of RC coupled two-stage amplifier with advantages, disadvantages and applications. [7]

- 6. (A) Write short note on Push Pull amplifier with waveforms. [7]
  (B) Explain the characteristics of JFET. [6]
- (A) Explain working of full wave bridge rectifier with R-L load. [6]
  (B) Draw and explain half wave precision rectifier. [6]

#### Or

8. (A) Compare single phase half-wave and full-wave rectifier. [6]

- (B) A 220V, 50 Hz ac voltage is applied to the primary of 4:1 stepdown transformer, which is used in bridge rectifier, having a load resistance of 1 K ohm. Assuming the diodes to be an ideal, determine the following : [6]
  - (*i*) DC output voltage
  - (ii) DC power delivered to the load
  - (*iii*) PIV of each diode.

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### [5252]-544

SE (Electrical) (First Semester) EXAMINATION, 2017 MATERIAL SCIENCE

#### (2015 PATTERN)

**Time : Two Hours** 

#### Maximum Marks : 50

#### Physical Constants :--

- (i) Angstrom Unit (AU) =  $1 \times 10^{-10}$  metres.
- (*ii*) Boltzmann's Constnat (k) =  $1.380 \times 10^{-23}$  joule.degree<sup>-1</sup>
- (*iii*) Charge on Electron (e) =  $1.601 \times 10^{-19}$  coulomb
- (*iv*) Mass of Electron (*m*) =  $9.107 \times 10^{-31}$  kg
- (v) Electron volt (eV) =  $1.602 \times 10^{-19}$  joules
- (vi) Mass of Proton (m<sub>p</sub>) =  $1.627 \times 10^{-27}$  kg.
- (vii) Velocity of light (c) =  $2.998 \times 10^8$  m/sec
- (*viii*) Dielectric Constant of free space ( $\varepsilon_0$ ) = 8.854 × 10<sup>-12</sup> F/m
  - (*ix*) Permeability of free space  $(\mu_0) = 4 \pi \times 10^{-7}$  H/m
  - (x) Debye Unit =  $3.33 \times 10^{-30}$  coulomb.metre

# **1.** (*a*) Explain : [6]

- (*i*) Polarization
- (ii) Pyroelectricity and
- (*iii*) Ferroelectricity.

### (b) State the properties and applications of : [6]

- (i) Asbestos
- (*ii*) Carbon.

- 2. (a) A parallel plate capacitor is used to store 16  $\mu$ C at a potentil of 8 kV. The distance between the plates is 10 × 10<sup>-4</sup> m. If the dielectric constant of the material is 20, kept between plates, what is the area of the plates ? [6]
  - (b) Discuss insulating materials used for transmission line. [6]
- **3.** (a) Explain Ferromagnetic and Ferrimagnetic materials and their applications. [7]
  - (b) Describe the properties and applications of the following materials : [6]
    - (i) Platinum
    - (*ii*) Molybdenum.

#### Or

(a)	Explain in detail BH curve (hysteresis loop) for ferroma	agnetic
	materials.	[6]
( <i>b</i> )	Write a short note on thermocouple.	[7]
( <i>a</i> )	Write down applications of carbon nano tubes and BN	nano
	tubes.	[6]
( <i>b</i> )	Write a short note on : ZEBRA batteries.	[6]
	<ul> <li>(a)</li> <li>(b)</li> <li>(a)</li> <li>(b)</li> </ul>	<ul> <li>(a) Explain in detail BH curve (hysteresis loop) for ferroma materials.</li> <li>(b) Write a short note on thermocouple.</li> <li>(a) Write down applications of carbon nano tubes and BN tubes.</li> <li>(b) Write a short note on : ZEBRA batteries.</li> </ul>

#### Or

**6.** (a) Write a short note on molecular machines. [6]

- (b) Explain with neat diagram, chemical reaction, applications of : [6]
  - (i) Nickel-cadmium battery and
  - (*ii*) Sodium-sulphur battery.

- 7. (a) Describe measurement of dielectric strength of solid insulating material with reference to IS. [7]
  - (b) What is dielectric loss ? Explain with a suitable phasor diagram and derivation. [6]

- 8. (a) With a neat sktech explain how flux density is measured with the help of gauss meter. [7]
  - (b) How will you test transformer oil ? Explain with neat diagram the test set up.[6]

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## [5252]-545

### S.E. (Electrical) (First Semester) EXAMINATION, 2017 ELECTRICAL MEASUREMENTS AND INSTRUMENTATION (2015 PATTERN)

Time : Two Hours

#### Maximum Marks : 50

#### **N.B.** :— (i) Neat diagrams must be drawn wherever necessary.

- (*ii*) Figures to the right indicate full marks.
- (iii) Use of logarithmic table, slide rule, Mollier chart, electronic pocket calculator and steam table is allowed.
- (iv) Assume suitable data, if necessary.
- (a) The resistance of a moving coil voltmeter is 12,000 Ω. The moving coil has 100 turns and is 4 cm long and 3 cm wide. The flux density in the airgap is 6×10<sup>-2</sup> Wb/m<sup>2</sup>. Find the deflection produced by 300 V if the spring control gives a deflection of one degree for a torque of 25×10<sup>-7</sup> N-m. [6]
  - (b) Explain the working of earth tester for measurement of each resistance with neat diagram. [6]

Or

- 2. (a) Explain the following terms related to instrument transformer :
  - (i) Transformation ratio
  - (ii) Nominal ratio
  - (*iii*) Burden.

- (b) With a circuit diagram derive the equation for balance in the case of Anderson bridge. [6]
- **3.** (a) Explain construction of low power factor wattmeter with neat diagram [7]
  - (b) A 220 V, 15 A single phase energy meter has a meter constant equal to 1,750 revolutions/kWh. The meter makes 350 revolutions in 275 seconds for rated load at 0.8 pf lagging. Find the error in meter reading. [6]

- 4. (a) Find the reading of two wattmeters in the following cases : [6]
  - (i) The load is 20 kW at unity power factor
  - (ii) The load is 20 kW at 0.8 pf
  - (iii) The load is at 20 kW at 0.5 pf.
  - (b) Explain the working principle and construction of single-phase induction type of energy meter with neat diagram. [7]
- 5. (a) The voltage across a 10 kΩ resistor is applied to CRO. The screen shows a sinusoidal signal of total vertical occupancy 5 cm and total horizontal occupancy of 4 cm. The front panel controls of V/div and time/div are on 2 V/div and 1 ms/div respectively. Calculate the rms value of the voltage across the resistor and its frequency. Also find rms value of current.

[7]

(b) List out and explain basic requirements of transducers. [6]

#### Or

- 6. (a) Explain the working of Pirani Gauge for measurement of pressure. State its limitations. [7]
  - (b) Write down advantages and applications of digital storage oscilloscope. [6]
- 7. (a) Explain level measurement by mechanical method. [6]
  - (b) Describe the construction of foil type strain gauges and explain their advantages over wire wound strain gauge. [6]

#### Or

- 8. (a) Draw and explain the construction and working principle of LVDT. State *four* advantages of LVDT. [6]
  - (b) Mention electrical methods of level measurement and explain any one electrical method of level measurement with neat diagram.
     [6]

3

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## [5252]-546

# S.E. (Electrical) (Second Semester) EXAMINATION, 2017 POWER SYSTEM-I

#### (2015 **PATTERN**)

Time : Two HoursMaximum Marks : 50

- N.B. :- (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right side indicate full marks.
  - (iv) Assume suitable data if necessary.
- (a) Explain in brief what is the need of equalization of potential over insulator string hence explain various methods to improve string efficiency of suspension insulators. [6]
  - (b) The tariff is Rs. 120 per kVA of maximum demand and 10 paisa per unit consumed. If the load factor is 30%, find the overall cost per unit at :
    - (i) Unity p.f. and
    - (*ii*) 0.8 p.f.

#### Or

**2.** (a) Explain what are base loads and peak loads hence explain various features of base load and peak load power stations.

[6]

- (b) A suspension string has 3 units each unit can withstand a max. voltage of 11 kV. The capacitance of each joint & metal work is 20% of capacitance of each disc.
   Find :
  - (*i*) Maximum line voltage for which the string can be used.
  - (*ii*) String efficiency. [6]
- (a) Derive an expression for internal and external flux linkages of conductor. [7]
  - (b) Derive an expression for insulation resistance of single core cable hence determine insulation resistance of single core cable of length 3 km long having conductor diameter 25 mm, insulation thickness 10 mm and specific resistance of insulation of 5 \*  $10^{12} \Omega m$ . [6]

- 4. (a) An overhead transmission line conductor having a cross-sectional area of 2.5 cm<sup>2</sup>. Calculate the vertical sag lor a span of 300 meters where the other parameters are given below :
  Weight of the conductor = 2 kg/m
  Ultimate strength = 8000 kg/cm<sup>2</sup>
  Wind pressure = 37 kg/cm<sup>2</sup> of projected area
  Safety factor = 3
  - (b) Explain in brief what is meant by G.M.R. of conductor hence prove that for overhead transmission line conductor, G.M.R.
     equals to 0.7788 times radius of conductor. [6]

5. (a) A split phase 132 kV, 50 Hz single phase transmission line is shown in Fig. (1) conductor 1 & 2 in parallel form one path while conductors 1' & 2' in parallel form return path. The current is equally shared by the two parallel conductors. Determine the capacitance and charging current to neutral per km of the line. The radius of each conductor is 1.2 cm. [7]





 (b) Derive an expression for capacitance of three phase transmission line when conductors are unsymmetrically spaced but transposed.
 [6]

#### Or

- 6. (a) With neat diagram, derive an expression for capacitance of single phase transmission line considering effect of earth. [6]
  - (b) A 3-phase, 132 kV, 50 Hz transmission line consist of three conductors each of diameter 21 mm. The spacing between conductors is as follows :

A-B = 3 m, B-C = 5 m, C-A = 3.6 m. If the line length is 100 km, find charging current per phase. [7]

- 7. (a) Express the relationship for sending end voltage and current in terms of receiving end voltage and current for medium length transmission line with nominal 'Π' method of representation. Draw the phasor diagram. [6]
  - (b) Classify transmission lines based on length, voltage and line constants.

- 8. (a) What do you understand by medium transmission lines ? How capacitance effects are taken into account in such lines ? [6]
  - (b) With necessary phasor diagram, deduce an expression for sending end voltage of a short transmission line in terms of line parameters. [6]

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# [5252]-547

S.E. (Electrical Engineering) (Second Semester)

#### **EXAMINATION, 2017**

#### **ELECTRICAL MACHINES-I**

#### (Thoery)

#### (2015 **PATTERN**)

#### **Time : Two Hours**

#### Maximum Marks : 50

N.B. :- (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4,
 Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (iii) Figures to the right indicate full marks.
- (*iv*) Use of algorithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- (v) Assume suitable data, if necessary.
- (a) Develop equivalent circuit of single phase transformer referred to secondary side. State clearly the assumptions made. [7]
  - (b) State the necessity of parallel operation of transformer. State any *four* necessary conditions for satisfactory parallel operation of transformer. [6]

- 2. (a) Two single phase transformer with equal turns have impedances of (0.5 + j3) ohm and (0.6 + j10) ohm with respect to secondary. These transformers are connected in parallel. Find the kVA and kW shared by each transformer if the total load of 100 kW at power factor 0.8 lagging is connected to them. [7]
  - (b) Define voltage regulation of a transformer. Describe the effectof power factor on voltage regulation of transformer. [6]
- 3. (a) A 500 volt DC shunt motor has armature resistance of 1.2 ohm and field resistance of 500 ohm respectively on no-load it runs at 1000 rpm drawing current of 4 Amp from supply. Find the speed if motor is loaded and takes a current of 26 Amp.

Also find speed when resistance of 2.3 ohm is connected in series with armature. The current taken by motor at this condition is 26 Amp. [6]

- (b) In case of DC machine, state the material used and function of the following parts : [6]
  - (*i*) Commutator
  - (ii) Yoke
  - (*iii*) Brush.

#### Or

4. (a) Derive the torque equation of DC motor by usual notation.State clearly the meaning of each term used in the derivation.

[6]

- (b) Draw and explain the following characteristics of DC shunt motor : [6]
  - (*i*) Torque-armature current
  - (*ii*) Speed-armature current.
- 5. (a) Draw a neat sketch of star-delta starter used for 3-phase squirrel cage induction motor. Explain its working. [6]
  - (b) The power input to a 3-phase, 6 pole, 50 Hz induction motor is 47 kW at certain load. The stator losses are 1.5 kW and mechanical losses are 1 kW respectively. Find the output power of motor in HP if it runs at 970 rpm. [7]

- 6. (a) State the similarities and differences between 3-phase induction motor and transformer (3 each). [6]
  - (b) Derive the expression for the following ratio  $\frac{\text{Full load torque}}{\text{Maximum torque}}$ for a 3-phase induction motor. [7]
- (a) State the effect of addition of rotor resistance on torque-slip characteristics of 3-phase induction motor. Draw the torque-slip characteristics for different values of rotor resistance and explain it in brief.
  - (b) Explain no-load test on 3-phase induction motor with a suitable diagram. Also elaborate how magnetising circuit parameters are obtained from no-load test.
     [6]

- 8. (a) A 3-phase induction motor with star connected rotor has standstill induced emf between sliprings = 173.2 volt. The standstill rotor impedance per phase is (0.2 + j1.5) ohm. Find the rotor current :
  - (*i*) At start, when started with external resistance adjusted to obtain maximum torque at start.
  - (*ii*) When running at slip of 5% with sliprings short circuited. [6]
  - (b) Compare the following starters used for 3-phase induction motor.
     Star-delta starter, Autotransformer strater (Minimum 3 points of comparison expected).

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### [5252]-548

Maximum Marks : 50

# S.E. (Electrical Engineering) (Second Semester) EXAMINATION, 2017 NETWORK ANALYSIS

#### (2015 PATTERN)

### Time : Two Hours

- - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figure to the right indicate full marks.
  - (*iv*) Use of calculator is allowed.
  - (v) Assume suitable data, if necessary.

**1.** (*a*) Explain the following terms in relation with network graphs: [6]

- (*i*) Tree
- (*ii*) Cut set
- (*iii*) Tie set.
- (b) In the circuit shown, find current I, using superposition theorem.

[7]



2. (a) Find current Ix and Iy for the circuit shown in figure using mesh analysis. [6]



(b) Verify the reciprocity theorem for the voltage source and currentIx for the circuit shown in figure. [7]



 $\mathbf{2}$ 

3. (a) A 5  $\mu$ F capacitor is initially charged with 500  $\mu$ C. At t = 0, the switch K is closed. Determine the voltage drop across the resistor at  $t < \tau$  and at  $t = \infty$  [6]



(b) In the network shown in figure the switch is moved from position a to b at t = 0. Determine i(t) and  $V_c(t)$  using Laplace transform. [6]



[5252]-548

4. (a) As shown in circuit, switch K is changed from position 1 to position 2 at time t = 0, steady state condition reached before switching. Find I, di/dt, d<sup>2</sup>i/dt<sup>2</sup> at t = 0<sup>+</sup>. [6]



(b) In the network shown in figure was in a position 'a' for long time and moved to position 'b' at t = 0. Find the current through the capacitor for t > 0 using Laplace transform. [6]



- 5. (a) Develop the relationship between transmission parameter and Y parameters. [6]
  - (b) Find the driving point impedance for the network shown in figure. [7]





6. (a) Find Z parameter of the network shown in figure. [6]



(b) Find the driving point admittance  $Y_{11}(s)$  for the network shown in figure, and plot pole zero diagram. [7]



7. (a) Explain the following terms in relation with filter : [6]

- (i) Pass band
- (ii) Stop band
- (*iii*) Cut-off frequency
- (b) Design a T and  $\pi$  section Constant-K high pass filter having cut-off frequency of 12 kHz and nominal impedance  $R_0 = 500\Omega$ . Also find : [6]
  - (*i*) its characteristic impedance and phase constant at 24 kHz and
  - (ii) attenuation at 4 kHz

#### Or

- 8. (a) Derive the expression for characteristic impedance (Z<sub>o</sub>), attenuation constant (α) and phase constant (β) of prototype constant-K type low pass filter from symmetrical networks. [6]
  - (b) Design constant –K high pass filter T and  $\pi$  section having  $f_c = 5$  kHz and nominal characteristic impedance  $R_0 = 600 \Omega$ . [6]

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### [5252]-549

### S.E. (Electrical) (Second Semester) EXAMINATION, 2017 NUMERICAL METHOD AND COMPUTER PROGRAMMING (2015 PATTERN)

Time	:	Two	Hours								Ma	xim	um	Ma	ark	<b>S</b> :	50
<i>N.B</i> .	:—	( <i>i</i> )	Attempt	Q.	No.	1	or	Q.	No.	2,	Q.	No	3	or	Q.	No.	4,
			Q. No.	<b>5</b> <i>o</i>	or Q.	N	Jo.	6,	Q.	No.	7	or	Q.	No.	8.		

- (ii) Neat diagrams must be drawn wherever necessary.
- (iii) Figures to the right indicate full marks.
- (*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- (v) Assume suitable data, if necessary.

**1.** (a) Explain round off error and truncation error with example. [6]

- (b) Give syntax of :
  - (i) for loop
  - (ii) while loop
  - (*iii*) do-while loop

Or

(a) Write short note on decision-making statements in 'C' language.
 [6]

(b) Perform two interations of Birge Vieta method to find root of the following equation with initial approximation  $P_0 = 0.5$ . [6]

$$f(x) = x^3 - 2x^2 - 5x + 6$$

**3.** (a) The current in a particular circuit is given by  $I^3 - 5I - 7$ = 0. Find current value using Regula-Falsi method correct upto 3 decimal places. Take  $I_0 = 2$  and  $T_1 = 3$ . [7]

P.T.O.

[6]

(b) Derive the formula of Newton's forward interpolation for equally spaced data points. [6]

#### Or

- (a) Explain with neat diagram bisection method of solution of transcendental equation. Comment on its rate of convergence as compared to other methods. [6]
  - (b) For the following data points, find f(1.1) using Lagrange's interpolation : [7]

x	f(x)
1	1
1.2	1.095
1.3	1.140
1.4	1.183

- 5. (a) Explain Taylor series method for solution of ordinary differential equation. [6]
  - (b) Evaluate the given integral using trapezoidal rule. Take h = 0.5, k = 0.5. [6]

$$I = \int_{1}^{2} \int_{1}^{2} \frac{dxdy}{x+y}$$

Or

- 6. (a) Derive Simpson's  $\frac{1}{8}$ th formula as a special case of Newton Cote's quadrature formula for Numerical Integration. [6]
  - (b) Apply Runge-Kutta fourth order method to find an appropriate value of y when x = 0.2, given that  $\frac{dy}{dx} = x + y$  and y = 1when x = 0. [6]

- 7. (a) Using Jacobi iterative method solve the following system of linear simultaneous equations. [6] Take x<sup>(0)</sup> = y<sup>(0)</sup> = z<sup>(0)</sup> = 0 perform 4 iterations.
  - 3x + y + z = 2x + 4y + 2z = -5x + 2y + 5z = 2
  - (b) Using power method, find the largest eigen value of the matrix  $\begin{bmatrix} 0 & -7 \end{bmatrix}$

$$A = \begin{bmatrix} 3 & -5 \\ -2 & 4 \end{bmatrix}$$
 by power method taking initial vector as  
$$X_0 = \begin{bmatrix} 0 \\ 1 \end{bmatrix}.$$
 [7]

- 8. (a) Explain Gauss-Elimination method for solution of system of linear simultaneous equations. [6]
  - (b) Find inverse of matrix  $A = \begin{bmatrix} 8 & -4 & 0 \\ -4 & 8 & -4 \\ 0 & -4 & 8 \end{bmatrix}$  using Gauss-Jordan method. [7]

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### [5252]-550

# S.E. (Electrical) (Second Semester) EXAMINATION, 2017 FUNDAMENTALS OF MICROCONTROLLER AND **ITS APPLICATIONS**

#### (2015 **PATTERN**)

#### Time : Two Hours

- **N.B.** :- (i) Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii)Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv)Assume suitable data, if necessary.
- 1. (a)Draw and explain internal RAM organization of 8051 microcontroller. [6]
  - *(b)* Explain the instruction with example : [6]
    - (1)MOVX A,@DPTR
    - (2)RLC A.

#### Or

- Explain the function of pains  $\overline{PSEN}$ ,  $\overline{EA}$  and ALE. 2. [6] (a)Explain Stack and enlist Stack related instructions. (*b*) [6]
- 3. Write a short note on interrrupt structure of 8051 (a)microcontroller. [7]

P.T.O.

#### Maximum Marks : 50

(b) Write a program to copy the content of 10 elements from locations 50 H onwards to external memory location C050H onwards.
 [6]

Or

- 4. (a) Draw the format of TCON register and explain each bit in the register. [7]
  - (b) Write program to transfer letter 'A' serially at baud rate 9600, use serial pin in mode 1. Assume crystal frequency 11.0592 MHz.
     [6]
- 5. (a) Draw and explain functional block diagram of 8255 PPI [6]
  - (b) Explain the following microcontroller development tools : [6]
    - (1) Assembler
    - (2) Simulator
    - (3) Compiler.

#### Or

6. (a) Draw and explain I/O mode of 8255 PPI. [6]

- (b) Draw 8051 based system to interface DAC. Write a program to generate triangular wave. [6]
- 7. (a) Draw and explain power factor measurement using 8051. [7]
  - (b) Write an assembly language program for 8051 to rotate stepper motor in clockwise and anticlockwise direction with step angle 1.8°.
     [6]

#### Or

8. (a) Draw interfacing diagram of LCD with 8051. Also explain function of LCD pins. [7]

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 $\mathbf{2}$ 

- (b) Write a program to monitor a status of SW, if SW is connected to Pin P2.1 and do the following : [6]
  1. If SW = 1 DC Motor rotate in Clockwise direction
  - 2. If SW = 0 DC motor rotate in anticlockwise direction

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# [5252]-551

Maximum Marks : 50

### S.E. (Instrumentation & Control) (First Semester) EXAMINATION, 2017 SENSORS AND TRANSDUCERS—I (2015 PATTERN)

#### Time : Two Hours

#### **N.B.** :— (i) Neat diagram must be drawn wherever necessary.

- (ii) Figures to the right indicate full marks.
- (iii) Assume suitable data, if necessary.

1.	<i>(a)</i>	What is meant by measurement. Explain the functional	n the functional elements		
		of a measurement system.	[6]		

(b) Explain the working principle of strain gauge. How is temperature compensation achieved for the same. [6]

#### Or

### 2. (a) Explain the following terms : [6]

- (*i*) Accuracy
- (ii) Calibration
- (iii) Resolution
- (*iv*) Sensitivity.
- (b) Explain LVDT in detail with neat diagram and draw its characteristics. [6]
- 3. (a) Explain the working principle of encoder with its applications. [6]
  - (b) List different techniques for force measurement. Explain the working principle of the Torsion bar. [6]

- 4. (a) Explain the magnetic pickup sensor for speed measurement. [6]
  - (b) Define piezoelectric effect. Explain piezoelectric sensor for force measurement with neat diagram. [6]
- 5. (a) List different types of elastic transducer for pressure measurement. Explain the working of any *one* of them. [7]
  - (b) Define gauge pressure, absolute pressure and atmospheric pressure. Explain U tube manometer for pressure measurement with neat diagram.
     [6]
    - Or
- 6. (a) List techniques for differential pressure measurement. Explain the working of any *one* of them. [7]
  - (b) Give units of pressure. Explain the working of any one low pressure gauge.[6]
- 7. (a) Explain the working principle of pyrometer for measurement of temperature. [7]
  - (b) Explain the working principle and construction details of RTD. [6]

- 8. (a) Explain bimetallic thermometer with neat diagram. [6]
  - (b) Explain working principle of thermocouple and necessity of cold junction compensation for temperature measurement. [7]

Seat	
No.	

### [5252]-552

# S.E. (Instrumentation and Control) (I Sem.) EXAMINATION, 2017 BASIC INSTRUMENTATION

#### (2015 COURSE)

Time : Two Hours

Maximum Marks : 50

N.B. := (i) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.

- (*ii*) Figures to the right indicate full marks.
- (*iii*) Assume suitable data, if necessary.
- (*iv*) Use of non-programmable calculator is allowed.
- (v) Neat diagrams must be drawn wherever necessary.
- 1. (a) Explain the functional elements of measurement system with neat block diagram. [6]
  - (b) A basic d'Arsonval meter movement with an internal resistance is 100 Ω and a full scale current of 1 mA, is to be converted into a multirange d.c. voltmeter with ranges of 0-10V, 0-50V and 0-100V (draw circuit diagram). [6]

#### Or

- 2. (a) A voltage has a true value of 1.50 V. An analog indicating instrument with a scale range of 0-2.5 V shows a voltage of 1.46 V. What are the values of absolute error and correction factor. Express the % error as a fraction of the true value and the full scale deflection. [6]
  - (b) Explain the methods which provide controlling forces in PMMC instrument with neat diagrams. [6]

3.	( <i>a</i> )	Derive	the	equations	for	unknowns	in	Maxwell's	inductance-
		capacita	ance	bridge.					[6]

- (b)Explain the following terms w.r. to oscilloscope : [6]
  - Positioning Control (i)
  - Focus Control (ii)
  - (*iii*) Astigmatism.

- **4**. (a)List the applications of analog CRO. Explain briefly the procedure of current measurement by analog CRO with suitable diagram.[6]
  - Differentiate between DC and AC Bridges. (b)[6]
- 5. Explain the single phase digital energy meter with neat (a)diagram. [6]
  - Draw and explain the block diagram of digital instrumentation (b)system. Give the name of each component in real time system w.r. to each block. [7]

#### Or

- 6. (a)Give specifications of digital instrumentation system. [2]
  - Draw the block diagram of ultrasonic distance meter. Explain (b)[6] the working of each block.
  - Compare analog measurement system and digital measurement (*c*) system. [5]
- 7. Explain briefly the galvanometric recorder with neat diagram.[7] (a)
  - Write a short note on Virtual Instrumentation. [6] (b)

#### Or

8. (*a*) Compare galvanometric recorder and potentiometric recorder.[6] (b)Draw a neat diagram of function generator and explain it briefly.[7] [5252]-552

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No.	

# [5252]-553

### SE (Instrumentation and Control) (First Semester) EXAMINATION, 2017 LINEAR INTEGRATED CIRCUITS (2015 PATTERN)

### Time : Two Hours

### Maximum Marks : 50

- N.B. :- (i) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 and Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right indicate full marks.
  - (iv) Use of calculator is allowed.
  - (v) Assume suitable data, if necessary.
- 1. (a) Explain the characteristics of ideal OPAMP. [6]
  - (b) Define the following OPAMP parameters :
    - (i) Slew rate
    - (ii) CMRR
    - (iii) PSRR.

Explain why open loop OPAMP configurations are not used in linear applications. [6]

### Or

2. (a) Why is slew rate important ? Explain in two-three lines. [3]

- (b) What is slew rate limiting frequency ? How to check it practically ? [3]
- (c) Draw pin diagram of IC 741 or OP-07. Explain the function of each pin.[6]

- 3. (a) Derive expression for output voltage of Instrumentaion amplifier with three OPAMPs. [6]
  - (b) Implement

$$V_0 = 2V_1 - 3V_2 + 4V_4$$

by using operational amplifier. [6]

Or

- 4. (a) Derive equation for output voltage of basic integrator. [6]
  - (b) Derive equation for output voltage of basic differentiator. [6]
- 5. (a) Design a stable multivibrator for output pulse width  $t_p = 10$  ms. Draw circuit diagram and input-output waveforms. [7]
  - (b) Define load regulation and line regulation. By using IC 723 design linear voltage regulator for regulated voltage of 10 volts. [6]

#### Or

- 6. (a) Write features of IC 7805 or IC 723. [4]
  - (b) What is the difference between series regulator and switching regulator ? [3]
  - (c) Draw pin diagram of IC555. Explain the function of each pin. [6]
- 7. (a) Design second order high pass filter at a high cutoff frequency of 1 kHz.[6]

(b) Explain with circuit diagram 'wide band pass filter'. [7] [5252]-553 2

Or
----

8.	<i>(a)</i>	How an active filter offers advantage over passive filter ? Include
		points : gain and frequency flexibility, loading problem, cost/
		inductor absence. [6]
	( <i>b</i> )	In a second order Low pass filter, what is the use of two
		capacitors ? Explain. [3]
	( <i>c</i> )	What is notch filter ? Explain. [4]

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# [5252]-554

### SE (Instrumentation&Control) (First Semester) EXAMINATION, 2017 NETWORK THEORY (2015 PATTERN)

Time : Two HoursMaximum Marks : 50N.B. :- (i)Solve Q. 1 or Q. 2, Q. 3, or Q. 5, or Q. 6, and<br/>Q. 7, or Q. 8. Total four questions to be attempted<br/>minimum.

- (*ii*) Start each question on a new page.
- (iii) Assume suitable data wherever required.
- 1. (a) Explain sign connections to be used in KCL and KVL. Find the voltage across 2A source. [6]



(b) Solve the following circuit, find current through r resistance.Use superposition theorem. [6]



- (a) A balanced star connected load had an impedance of (2+j3.46)
  Ω between line and neutral. If the voltage across phase R be 20<30°, find current in phase y and B. What is the voltage from line star to neutral ? Also obtain V<sub>RB</sub>. [6]
  - (b) For the circuit shown below, find the value of V<sub>th</sub> that will determine the maximum power delivered. [6]



(a) Find driving point impedance functions-Z<sub>11</sub>(s) and Z<sub>21</sub>(s) in the following circuit : [6]



(b) Derive h parameter in terms of all other parameters. [6] [5252]-554 2

- 4. (a) Explain the necessary conditions for driving point impedance. [6]
  - (b) A  $\pi$  attenuator has been shown in Fig below. Find Yparameters and draw the equivalent Y-parameter circuit. [6]



5. (a) Check positive realness of the following : [6]  $s^{2} + 10s + 4$ 

(*i*) 
$$\frac{3 + 103 + 4}{s + 2}$$
  
(*ii*)  $\frac{s^2 + 2s + 20}{s + 10}$ 

(b) Explain classification of networks in brief. [6]

#### Or

6. (a) State properties of RC driving point impedance function.

[6]

- (b) Design a band pass filter with L = 20 mH, C = 92 nF,  $R_F = 40$  ohms by calculating resonance frequency, band width, and cut-off frequencies. Assume load resistance 500 ohms. [6]
- 7. (a) Derive expression for symmetrical  $\pi$  attenuator. Obtain design equation for the same. [6]

3

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(b) Test whether the following polynomial is Hurwitz or not : [8]

- (i)  $2S^3 + 4S^2 + 18S + 6$
- (ii) 4S<sup>3</sup> + 6S<sup>2</sup> + 3S + 6
- (iii) 2S<sup>2</sup> + 6S + 1
- (iv) S<sup>2</sup> + 4S + 10

- 8. (a) Write technical notes on Routh's-Hurwitz polynomial. [6]
  - (b) Find first and second Cauer network for the function: [8]

$$Z(s) = \frac{s^2 + 5s + 4}{s^2 + 2s}$$

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# [5252]-555

## S.E. (Instrumentation & Control) (Second Semester) EXAMINATION, 2017 SENSORS AND TRANSDUCER II (2015 PATTERN)

### **Time : Two Hours**

### Maximum Marks : 50

- **N.B.** :— (i) Neat diagram must be drawn wherever necessary.
  - (ii) Figures to the right indicate full marks.
  - (iii) Assume suitable data, if necessary.
- **1.** (*a*) Explain the working principle of electromagnetic flowmeter with a neat diagram. State its advantages and disadvantages. [6]
  - (b) Explain radioactive level measurement in detail with a neat diagram.

Or

- **2.** (a) Write short notes on : [6]
  - (1) Rotameter
  - (2) Newtonian fluid and Non-Newtonian fluid
  - (b) Explain ultrasonic sensor for level measurement. State its advantages and disadvantages. [6]
- (a) Define dynamic viscosity and kinematic viscosity. List down four methods for viscosity measurement. [6]
  - (b) Explain the working principle of inductive proximity sensor.

[6]

- 4. (a) Define density. Explain hydrostatic head method for density measurement. [6]
  - (b) Define Absolute Humidity and Relative Humidity. Explain any one sensor for humidity measurement. [6]
- **5.** (a) Explain the following terms :
  - (1) Signal level and bias change
  - (2) Linerization
  - (3) Analog to Digital Converter. [6]
  - (b) What is the output voltage of a 10-bit DAC with a 10 V reference if the input is  $(i) (20F)_{16}$ ,  $(ii) (0B5)_{16}$ . What input is needed to get a 6.5 V output ? Also calculate the conversion resolution of the DAC. [7]

### Or

6. (a) A resistance thermometer with an accuracy of 2°C is used to sense temperature in the range of 50°C to 80°C. The resistance coefficient at 65°C is 0.004/°C and resistance at 65°C is 150Ω. The power dissipation constant of the sensor is 2 mW/°C. Find the maximum current excitation required. Design a Wheatstone bridge to provide null output at 50°C. Assume bridge supply to be 5 V.

[7]

(b) The input to a 10-bit ADC with a 5 V reference is 1.45 V.
What is the hex output ? If the output was found to be (1B4)<sub>16</sub>, what is the voltage input ? [6]

- 7. (a) Design a signal conditioning circuit for RTD for the following data :
  Temperature range : 50°C to 300°C,
  RTD output resistance: 120 to 220Ω
  Output voltage range : 0 mV to 300 mV. [7]
  - (b) Explain the signal conditioning scheme for LVDT. [6] Or
- 8. (a) Explain the signal conditioning scheme for eapacitive level sensor. [6]
  - (b) Design a signal conditioning circuit for thermocouple for the following data : Temperature : 50°C to 200°C, Thermocouple output : 2.6 to 10.78 mV.
     Output voltage range : 0 mV to 3 V
     The reference junction temperature is maintained at 0°C.

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# [5252]-556

### S.E. (Instrumentation and Control) (Second Semester) EXAMINATION, 2017 AUTOMATIC CONTROL SYSTEM (2015 PATTERN)

### **Time : Two Hours**

### Maximum Marks : 50

- N.B. :- (i) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Use of non-programmable calculator is allowed.
  - (v) Assume suitable data, if necessary.
- 1. (a) Draw neat block diagram of closed loop control system. Explain function of each block in detail. Give suitable example. [6]
  - (b) Find transfer function of system represented by the following signal flow graph as shown in figure 1. [6]



Fig. 1 Signal Flow Graph

- **2.** (a) Obtain transfer function of thermal systems. [6]
  - (b) Draw equivalent electrical circuit for mechanical system as shown in figure 2 using force voltage analogy. [6]





(a) The characteristic equation of a feedback control system is found as :

 $s^4 + 9s^3 + 11s^2 + 6s + K = 0.$ 

Determine the value of K for which the system is absolutely stable and marginally stable. Also determine the frequency of sustained oscillation.

(b) A beedback control system with negative feedback is shown in Figure 3. Determine the value of K so that the system

 $\mathbf{2}$ 

will have a damping ratio of 0.6. Also for this value of K calculate maximum overshoot, peak time, setting time, rise time and steady state error for a unit ramp input. [8]



Fig. 3

- 4. (a) Draw the unit step response of second order control system for under damped condition, show all time domain specifications. [4]
  - (b) The open loop transfer function of a control system is given as [8]

$$G(s)H(s) = \frac{K}{(s+1)(s+10)(s+30)}$$

Draw the root locus. Determine the value of K for which the system is critically damped and also the value of K for which the system becomes unstable.

- **5.** (*a*) Explain mapping theorem in Nyquist plot. [4]
  - (b) Construct the bode plot for system whose open loop transfer function is : [9]

$$G(s) = \frac{1}{s(1+0.2s)(1+0.02s)}$$

Determine gain margin, phase margin and comment on stability.

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- 6. (a) Explain the terms Resonance Peak, Resonance Frequency, Bandwidth, Gain Margin, Phase Margin [5]
  - (b) Draw the polar plot for the following system :

(i) 
$$G(s)H(s) = \frac{1}{1+Ts}$$
  
(ii)  $G(s)H(s) = \frac{1}{s(1+Ts)}$ . [8]

- 7. (a) Give different advantages of state space representation over classical representation. [4]
  - (b) Obtain different forms of state model for system characterized by the following transfer function; [9]

$$G(s)H(s) = \frac{s+9}{s^3+9s^2+24s+20}$$
  
Or

- 8. (a) Explain the terms state, state variables, state equations and state space. [4]
  - (b) Convert the following state model into transfer function : [9]

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 1 & -2 \\ 4 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 2 \\ 1 \end{bmatrix} u$$
$$y = \begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

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# [5252]-557

## S.E. (Instrumentation and Control) (Second Semester) EXAMINATION, 2017

#### **ELECTRONIC INSTRUMENTATION**

### (2015 PATTERN)

**Time : Two Hours** 

Maximum Marks : 50

- **Instructions :** (*i*) All questions are compulsory.
  - (ii) Figures to the right indicate full marks.
- 1. (a) Explain true R.M.S. meter with neat schematic diagram.[6]
  - (b) Explain the following measurement errors associated with counter : [6]
    - (i) Gating error
    - (*ii*) Time base error
    - (iii) Trigger level error.

### Or

(a) Explain the principle of Q meter with practical Q meter circuit.
 [6]

- (b) Explain A.W.G in detail. [6]
- (a) What is PLL ? Define and explain the terms Centre Frequency.
   Lock Range and Capture range for IC 565. [6]
  - (b) Explain sample and hold circuit. [4]

	( <i>c</i> )	An 8-bit DAC has reference voltage $V_{ref}$ = 5 V. What it the
		output voltage when binary input is $B_{in} = 10110001$ ? [2]
		Or
4.	<i>(a)</i>	What is VCO ? Explain in detail. [6]
	( <i>b</i> )	Explain successive approximation ADC converter with block
		diagram. [6]
5.	( <i>a</i> )	What is Telemetry ? [2]
	( <i>b</i> )	Explain PCM. [5]
	( <i>c</i> )	Differentiate between A.M. and F.M. ? [6]
		Or
6.	<i>(a)</i>	Explain TDM in detail. [7]
	( <i>b</i> )	Write short note on Virtual Instrumentation. [6]
7.	( <i>a</i> )	Write short note on Logic Analyser. [6]
	( <i>b</i> )	Write short note on Wave Analysers. Draw and explain the
		block diagram of Frequency Selective Analyser. [7]
		Or
8.	<i>(a)</i>	Describe Distortion Analyser in detail [7]
	( <i>b</i> )	Explain the working of FFT analyser with the help of block
		diagram. [6]

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# [5252]-558

S.E. (Instrumentation & Control) (Second Semester) EXAMINATION, 2017 DIGITAL TECHNIQUES

### (2015 Pattern)

### **Time : Two Hours**

- **N.B.** :- (i) Neat diagrams must be drawn wherever necessary.
  - (*ii*) Figures to the right indicate full marks.
  - (*iii*) Answer Q. 1 or Q. No. 2, Q. 3 or Q. No. 4,
    Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
- (a) What is difference between gray codes and binary numbers? Enlist the salient features of gray code. Also explain typical application of gray codes. [6]
  - (b) Explain the following terms of Logic families : [6]
    - (1)  $V_{IH}(min)$  and  $V_{IL}$  (max)
    - (2) Sinking and sourcing current
    - (3) Propagation delay

#### Or

- 2. (a) Simplify the following function using K-map in the POS form  $F(A,B,C,D) = \Sigma m(0, 2, 3, 6, 7, 8, 10, 12, 13).$  [6]
  - (b) Explain how signed binary numbers are represented. [6]

P.T.O.

Maximum Marks : 50

**3.** (*a*) Implement the circuit of the full adder using 8×1 multiplexers. [7]

(b) Explain the different modes of operation of shift register. [6]

### Or

- **4.** (*a*) Explain BCD adder circuit with the help of neat diagram. [7]
  - (b) Draw the logic diagram of JK flip-flop using AND and NOR gates. Explain the truth table. Also explain the race around condition in JK flip-flop.
     [6]
- 5. (a) Implement the MOD 8 Johnson counter using D flip-flops. Write the counting sequence and draw the timing waveforms. [5]
  - (b) Design and implement MOD 10 counter using IC 7493. [5]
  - (c) In MOD 8 asynchronous counter, propagation delay of each flip-flop is 20 ns. What is maximum operation frequency of the counter ?
     [3]

#### Or

6. (a) Design a sequence generator using shift register that generates the following sequence of bits :

(b) Differentiate clearly between the synchronous and asynchronous counters. [5]

- 7. (a) Explain digital clock consisting of seconds, minutes and hours section in detail. [8]
  - (b) Explain the PLA in detail. [4]

- 8. (a) What are the advantages of PLDs over conventional digital circuits implemented using logic gates. Explain any one type of PLD in detail. [6]
  - (b) Explain the basic architecture of FPGA. [6]

**Time : Two Hours** 

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# [5252]-559

### S.E. (Instr. and Cont.) (Second Semester) EXAMINATION, 2017 INDUSTRIAL DRIVES

### (2015 **PATTERN**)

Maximum Marks : 50

- N.B. := (i) Solve Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.
  - (*ii*) Figures to the right indicate full marks.
  - (iii) Neat diagrams must be drawn whenever necessary.
  - (*iv*) Use of calculator is allowed.
  - (v) Assume suitable data if necessary.

### **SECTION-I**

- 1. (a) Write the construction, working and characteristics of TRIAC. [6]
  - (b) Explain the single phase half wave controlled rectifier with R load. Draw the waveforms. [6]

### Or

- 2. (a) What are choppers ? Explain basic principle and working with circuit diagram. [6]
  - (b) Explain the single phase half wave controlled rectifier with RL load. [6]
- **3.** (a) Explain printed circuit motor with diagram. Write advantages, disadvantages and one application of it. [6]

(b) Explain the working of universal motors with circuit diagram.
 What are the types of universal motors ? Explain the characteristics. [7]

#### Or

- **4.** (a) Mention various types of stepper motors ? Explain *one* type in detail with diagram. Write *two* applications of it. [7]
  - (b) Write the basic principle, construction and working of split phase motor. [6]

### **SECTION-II**

5.	<i>(a)</i>	What	are	chopper	drives	?	Explain	in	detail.	[6]
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(b) Explain the H-bridge drive in detail. [6]

### Or

- 6. (a) Explain the brushless dc motor drive in detail. [6]
  - (b) Write a short note on stepper motor sequencer and drive. [6]
- 7. (a) Explain the close loop control of single phase induction motor. [7]
  - (b) What is variable frequency drive ? Explain one type in detail. [6]

### Or

- 8. (a) Explain the close loop control of synchronous motor. [7]
  - (b) What is variable frequency drive? Explain one type in detail. [6]

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# [5252]-561

### S.E. (Computer) (First Semester) EXAMINATION, 2017 DISCRETE MATHEMATICS (2015 PATTERN)

### Time : Two Hours

### Maximum Marks : 50

- N.B.: (i) Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 and Q. No. 7 or Q. No. 8.
  - (*ii*) Figures to the right indicate full marks.
  - (iii) Assume suitable data, if necessary.
- 1. (a) Define the following with proper set notations and examples: [6]
  - (i) Membership
  - (ii) Proper subset
  - (iii) Power sets
  - (iv) Empty sets
  - (v) Cardinality of sets
  - (vi) Multisets.

(b) What are relations and functions. Given a Relation  $R = \{(1, 4), (2, 2), (3, 10), (4, 8)\} (5, 6)\}$  and check whether the following relations  $R_1$ ,  $R_2$ ,  $R_3 \& R_4$  is a function or not.  $R_1 = \{(1, 4), (2, 4), (3, 4), (4, 4), (5, 4)\}$   $R_2 = \{(1, 2), (2, 4), (2, 10), (3, 8), (4, 6), (5, 4)\}$   $R_3 = \{(1, 6), (2, 2), (4, 4), (5, 10)\}$   $R_4 = \{(1, 6), (2, 2), (3, 2), (4, 4), (5, 10)\}$  [6] P.T.O.

- 2. (a) Let A and B are two sets. If  $A \subseteq B$ , then prove that  $P(A) \subseteq P(B)$ , where P(A) and P(B) are power sets of A and B sets. [6]
  - (b) Define the closure of Relation. Discuss about the following closure properties with examples : [6]
    - (*i*) Reflexive closure
    - (*ii*) Symmetric closure
    - (*iii*) Transitive closure.
- **3.** (a) Explain the rule of sum and products with examples. [4]
  - (b) Find out how many 5-digit number greater than 30,000 can be formed from the digits 1, 2, 3, 4, 5. [4]
  - (c) Explain the directed and undirected graph with suitable example. [4]

Or

- 4. (a) Find the number of permutations which can be made with the letters of the word ENGINEERING. [4]
  - (b) Explain the Dijkstra's Algorithm in detail. [4]
  - (c) Define Subgraph.
    Determine whether H = H' = (V', E') is a subgraph of G(V, E) shown in Fig. 4.c : [4]



Fig. 4 (c) Graph G

**5.** (a) Use Prim's Algorithm to find the minimum spanning tree for the connected weighted graph G as shown in Fig. 5.a [7]



Fig. 5. a Graph G connected weighted Graph

(b) Explain any two of the following :

[6]

- (i) Min-max tree case study
- (ii) Transport network
- (*iii*) Decision tree.

Or

- **6.** (a) Explain the Kruskal's Algorithm in detail. [7]
  - (b) Find the pre, post and inorder traversal of a tree shown in Fig. 6.b.



**Fig. 6.** *b* **Tree** 3

P.T.O.

- (a) Consider the set A = {1, 3 5, 7, 9, .....} i.e. a set of odd positive integers. Determine whether A is closed under :
  - (*i*) Addition
  - (*ii*) Multiplication.
  - (b) Check whether the algebraic system (A, \*) whose table is given below is a SEMI Group. [4]

[4]

*	a	b	с
a	a	b	c
b	a	с	b
c	а	b	c

(c) Discuss in brief about the Galois theory—Field theory and group theory.[5]

Or

- 8. Define Algebraic system. Explain the steps to identify the following with suitable example : [13]
  - (i) Monoid
  - (ii) Abelian Group
  - (*iii*) Ring.

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# [5252]-562

# S.E. (Computer Engineering) (First Semester) EXAMINATION, 2017

# DIGITAL ELECTRONICS AND LOGIC DESIGN

### (2015 PATTERN)

Time : Two HoursMaximum Marks : 50N.B. := (i)Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6,

Q. 7 or Q. 8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (iii) Assume suitable data, if necessary.

 (a) Design and implement Binary to Gray code converter using logic gate. [6]

- (b) Explain look ahead carry generator in detail. [4]
- (c) Draw basic internal structure of Decade counter IC 7490 and explain its operation. [2]

Or

2. (a) Implement full adder using 8:1 Multiplexer and draw the diagram. [6]
(b) Write a short note on Johnson counter. [4]
(c) Convert the following flip-flop : [2]

D-Flip-Flop to T-Flip-Flop

- 3. (a) Design the ASM chart for a 2-bit binary counter having one enable line E such that when : [6]
  E = 1 (count enabled) and
  E = 0 (counting is disabled).
  - (b) A combinational Circuit is defined by the following function: [6]
    F1(A,B,C) = Σm (0,1,3,7)
    F2(A,B,C) = Σm (1,2,5,6)
    Implement this circuit with PLA.

- 4. (a) Write VHDL code for full adder using structural style of Modeling (Declare half adder as a component) and also draw truth table and diagram of full adder. [6]
  - (b) Explain entity declaration for XOR gate [2]
  - (c) A combinational circuit is defined by the function : [4]  $F1 = \Sigma m(0,1,3,4)$ Implement this circuit with PAL.

Or

5. (a) Draw and explain the circuit diagram of CMOS Inverter.

(b) Define the following terms and mention the standard values for TTL logic Family : [8]

[5]

- 1. Noise Margin
- 2. Fan Out
- 3. Power Dissipation
- 4. Propagation Delay.

### Or

6. (a) Draw and explain 2-input NAND TTL logic gate with totem pole output driver. [7]

(b) 1. Give the classification of logic family [6]
2. Explain the advantage of open collector output.

7. (a) Explain the features of 8051 Microcontroller [4]

- (b) What are the different addressing Modes in 8051 ? Give example of each. [6]
- (c) Explain the following pins of 8051: [3]
  - 1. ALE
  - 2. XTAL
  - 3.  $\overline{\mathbf{EA}}$ .

### Or

- 8. (a) Describe different timer modes of 8051 Microcontroller. Draw format of TMOD register. [7]
  - (b) Explain the following instructions with respective to 8051 and give example of each : [6]
    - 1. PUSH
    - 2. MUL
    - 3. CPL.

Time : Two Hours

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Maximum Marks : 50

# S.E. (Computer Engineering) (I Semester) EXAMINATION, 2017 DATA STRUCTURES AND ALGORITHMS

### (2015 PATTERN)

N.B. :- (i) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.

- (*ii*) Neat diagrams must be drawn wherever necessary.
- (iii) Assume suitable data, if necessary.
- 1. (a) Define and explain the following terms : [3]
  - (a) Data structure
  - (*b*) ADT
  - (c) Algorithm
  - (b) Give pseudo C/ C++ code to concatenate two strings. [3]
  - (c) Explain the Greedy strategy with suitable example. Comment on its time complexity. [6]

### Or

**2.** (a) Define and explain the following terms : [4]

- (a) Linear data structure
- (b) Non-linear data structure
- (c) Time complexity
- (d) Space complexity
- (b) What is sparse matrix ? Explain with suitable example. [2]
- (c) Explain the Asymptotic notation Big O, Omega and Theta with suitable example. [6]

- (a) Write a pseudo C/C++ code to delete intermediate node from singly linked list. [3]
  - (b) Explain Generalized linked list with example. [3]
  - (c) What is stack ? Write an ADT for stack. [6]

- **4.** (a) What is recursion ? Explain use of stack for recursion. [4]
  - (b) Explain the stepwise conversion using stack for the given infix expression to the postfix expression : [2]
     A \* (B + C) \* D
  - (c) Write pseudo C/ C++ code to represent Singly linked list asan ADT. [6]
- 5. (a) Define the following terms with example : [6]
  - (a) Dequeue
  - (b) Priority queue
  - (c) Linear queue
  - (b) Write a pseudo C/C++ code to implement circular queue using arrays. [7]

#### Or

- 6. (a) Explain linear queue and circular queue with suitable example. Give the advantages of circular queue over linear queue.[6]
  - (b) Explain priority queue. Give pseudo C/C++ code for array implementation of priority queue. [7]
- 7. (a) Sort the following numbers using Merge sort. [6]
  55, 85, 45, 11, 34, 05, 89, 99, 67
  Discuss its time complexity and space complexity.

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 $\mathbf{2}$ 

(b) Explain sequential search and binary search with appropriate example and compare their time complexity and space complexity.
 [7]

### Or

- 8. (a) Explain the algorithm of Quick sort with suitable example.Discuss its time complexity and space complexity. [6]
  - (b) Explain heap sort and sort the given list using heap sort :[7]
    18, 13, 12, 22, 15, 24, 10, 16, 19, 14, 30.

Seat	
No.	

# [5252]-564

## S.E. (Computer) (I Sem.) EXAMINATION, 2017 COMPUTER ORGANIZATION AND ARCHITECTURE (2015 PATTERN)

### Time : Two Hours

### Maximum Marks : 50

- N.B. : (i) Neat diagrams must be drawn wherever necessary.
  - (ii) Figures to the right side indicate full marks.
  - (iii) Use of calculator is allowed.
  - (iv) Assume suitable data if necessary.
- (a) Multiply the following using Booth' algorithm. [6]
   Multiplicand = + 11
   Multiplier = 6
  - (b) Explain in brief RAID levels in detail. [6]

Or

- 2. (a) Explain in detail IEEE standards for representing floating point numbers in the following formats.
  - (1) Single Precision
  - (2) Double Precision [6]
  - (b) Explain cache updating policies in detail. [6]
- **3.** (a) What is the use of DMA ? Explain cycle stealing in DMA.[6]
  - (b) What is machine instruction ? Explain any *three* types of operations.[6]

Or

4. (a) Compare memory mapped I/O and I/O mapped I/O. [06] P.T.O.

- (b) Explain the following addressing modes with *one* example each : [6]
  - (i) Displacement Addressing
  - (ii) Register Indirect
- 5. (a) List the features of 8086 microprocessor. [7]
  - (b) Write a short note on superscalar execution and superscalar implementation. [6]

- 6. (a) Explain the instruction pipelining. [6]
  - (b) Draw and explain architecture of 8086. [7]
- (a) Write a control sequence for the following instruction for single bus organization : ADD (R3), R1 [6]
  - (b) Explain in detail state table design method for hardwired control design. [7]

### Or

- 8. (a) Draw and explain in detail block diagram of hardwired control unit. [7]
  - (b) List the applications of microprogramming. [6]

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### [5252]-565

### S.E. (Computer) (I Semester) EXAMINATION, 2017 OBJECT ORIENTED PROGRAMMING (2015 PATTERN)

Time : Two HoursMaximum Marks : 50N.B. :- (i)Answer question 1 or 2, 3 or 4, 5 or 6 and 7 or 8.

- (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data if necessary.

- (a) What is class and object ? Differentiate between class and object.
   [6]
  - (b) Write a program which uses default constructor, parameterized constructor and destructor. [6]

### Or

- (a) Discuss the ways in which inheritance promotes software reuse, saves time during program development and helps prevent errors.
  - (b) When would you choose to use C rather than C++ ? [4]
  - (c) What is the use of this pointer ? [3]
- (a) Write a program to find the sum of an array Arr by passing an array to a function using pointer. [4]
  - (b) Differentiate compile time and run time polymorphism. [4]
  - (c) What is difference between pointer and references ? Explain using program. [4]

- 4. (a) Explain public, private and protected keywords using program.[6]
  - (b) Explain what is type casting, Implicit type casting and explicit type casting.[6]
- 5. (a) What is a Stream ? Explain types of streams available in C++. [6]
  - (b) What is generic programming ? How is it implemented in C++ ?[7] Or
- 6. (a) Explain Command line arguments in C++. Write program to explain the same. [6]
  - (b) What are various functions which are used to manipulate file pointers ? Explain using examples. [7]
- 7. (a) What is the purpose of (1) Container (2) Algorithms and(3) Iterators. [6]
  - (b) What is the STL ? Why should a C++ programmer be interested in the STL ? What is the design philosophy of the STL ?What are the major components of the STL ? [7]

#### Or

- 8. (a) Use minimum 8 functions of Deque STL. Write a program to explain the same. [6]
  - (b) What is a stack ? How is it implemented using STL ?[7]

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No.	

# [5252]-566

### S.E. (Computer/IT Engineering) (Second Semester) EXAMINATION, 2017 ENGINEERING MATHEMATICS III (2015 Course)

### **Time : Two Hours**

### Maximum Marks : 50

**N.B.** :- (i) Neat diagrams must be drawn wherever necessary.

- (ii) Figures to the right indicate full marks.
- (iii) Your answers will be valued as a whole.
- (iv) Use of electronic pocket calculator is allowed.
- (v) Assume suitable data, if necessary.

**1.** 
$$(a)$$
 Solve any  $two$ :

- (i)  $\frac{d^2 y}{dx^2} + 3\frac{dy}{dx} + 2y = 2e^{e^x}$
- (*ii*) (D<sup>2</sup> + 4D + 4)y =  $x^{-3} e^{-2x}$

(*iii*) 
$$x^2 \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} + 5y = x^2 \sin(\log x)$$

(b) Find the Fourier transform of : [4]

$$f(x) = 1,$$
  $|x| \le 1$   
= 0,  $|x| > 1$ 

and evaluate  $\int_0^\infty \frac{\lambda \cos \lambda x}{\lambda} d\lambda$ .

P.T.O.

### [8]
2. (a) An inductor of 0.5 henries is connected in series with a registor of 6 ohms, a capacitor of 0.02 farads, a generator having alternative voltage given by 24 sin 10 t, t > 0 and switch k. Set up a differential equation for this circuit and find charge at time t. [4]

(*i*) Find 
$$z\{f(k)\}$$
, where  $f(k) = 3^k, k < 0$   
=  $2^k, k \ge 0$ 

(ii) Find :

$$z^{-1}\left\{\frac{z^2}{z^2+1}\right\}$$

by using inversion integral method.

- (c) Solve the following difference equation : [4] y(k + 2) - 5y(k + 1) + 6y(k) = 36 y(0) = y(1) = 0.
- **3.** (a) Calculate the first four central moments from the following data and hence find  $\beta_1$  and  $\beta_2$ : [4]

x	0	1	2	3	4	5	6
f	5	15	17	25	19	14	5

(b) Fit a straight line to the following data by least square method : [4]

x	0	5	10	15	20	25
у	12	15	17	22	24	30

- (c) The number of breakdowns of a computer in a week is a Poisson variable with  $\lambda = np = 0.3$ . What is the probability that the computer will operate : [4]
  - (i) with no breakdown and
  - (*ii*) at the most one breakdown in a week.

- 4. (a) The average test marks in a particular class is 79 and standard deviation is 5. If the marks are normally distributed, how many students in a class of 200, did not receive marks between 75 and 82. Given z = 0.8, Area = 0.2881 and z = 0.6, Area = 0.2257. [4]
  - (b) An insurance agent accepts policies of 5 men of identical age and in good health. The probability that a man of this age will be alive 30 years hence is 2/3. Find the probability that in 30 years : [4]
    - (i) all five men and
    - (*ii*) at least one man will be alive.
  - (c) The two variables x and y have regression lines : [4] 3x + 2y - 26 = 0 and 6x + y - 31 = 0Find :
    - (i) the mean values of x and y and
    - (*ii*) correlation coefficient between x and y.
- 5. (a) Find the directional derivative of a scalar point function  $\phi = xy^2 + yz^3$  at (2, -1, 1) in the direction of a vector 4i + 2j + 4k. [4]

## [5252]-566

(b) Show that the vector field :

 $\overline{F} = (6xy + z^3)i + (3x^2 - z)j + (3xz^2 - y)k$ 

is irrotational and hence find a scalar potential function  $\phi$  such that  $\overline{F} = \nabla \phi$ . [4]

(c) Find the work done by the vector field : [5]  

$$\overline{F} = (x^2 - yz)i + (y^2 - zx)j + (z^2 - xy)k$$
  
in moving a particle of unit mass from (1, 1, 1) to (2, -1, 2).  
*Or*

6. (a) Find the directional derivative of a scalar point function  $\phi = xy - z^2 + 2xz$  at (1, 0, 2) in the direction of 4i - j+ 2k. [4]

(b) Show that (any one) : 
$$[4]$$

(i) 
$$\nabla\left(\frac{\overline{a}.\overline{r}}{r^n}\right) = \frac{\overline{a}}{r^n} - \frac{n(\overline{a}.\overline{r})\overline{r}}{r^{n+2}}$$
, where  $\overline{a}$  is a constant vector.

(*ii*) 
$$\nabla^2 \left( \nabla \cdot \frac{\overline{r}}{r^2} \right) = \frac{2}{r^4}.$$

(c) Evaluate the integral 
$$\int_{c}^{\overline{F} \cdot d\overline{r}}$$
, along the curve  $x = 2t$ ,  
 $y = t$ ,  $z = 3t$  from  $t = 0$  to  $t = 1$ , where  $\overline{F} = 3x^{2}i$   
 $+ (2xz - y)j + zk$ . [5]

**7.** (*a*) If :

$$u = - 2xy + \frac{y}{x^2 + y^2},$$

find v such that f(z) = u + iv is analytic. Determine f(z) in terms of z. [4]

(b) Evaluate 
$$\oint_{C} \frac{e^{z}}{(z+1)(z+2)} dz$$
, where *c* is the contour

$$|z + 1| = \frac{1}{2}.$$
 [5]

(c) Find the Bilinear transformation which maps the point 
$$-i$$
, 0, 2 + *i* of the *z*-plane onto the points 0,  $-2i$ , 4 of the *w*-plane. [4]

**8.** (a) If :

$$u = \frac{1}{2}\log(x^2 + y^2),$$

find v such that f(z) = u + iv is analytic. Determine f(z) in terms of z. [4]

(b) Evaluate 
$$\oint_{C} \frac{\sin \pi z^2 + 2z}{(z-1)(z-2)} dz$$
, where c is the circle  $|z| = 4$ .  
[5]

(c) Find the image of the circle 
$$(x - 3)^2 + y^2 = 2$$
 under the transfromation  $w = \frac{1}{z}$ . [4]

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No.	

# [5252]-567

# S.E. (Computer Engg.) (Second Semester) EXAMINATION, 2017 COMPUTER GRAPHICS

## (2015 **PATTERN**)

Time : 2 Hours

Maximum Marks : 50

- **N.B.** :— (i) Neat diagrams must be drawn wherever necessary.
  - (ii) Assume suitable data, if necessary.
  - (iii) Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and
    Q. 7 or Q. 8.

1. (a) Explain the following terms with examples (any three) : [6]

- (1) Display file structure
- (2) Winding Method
- (3) Polygon filling with pattern
- (4) Generalised Clipping.
- (b) Explain Bresenham algorithm for line drawing. Write advantages and disadvantages of it over DDA line drawing algorithm. [6]

Or

- (a) Explain Sutherland-Hodgeman algorithm for polygon clipping.
   Compare it Cohen-Sutherland Clipping. [6]
  - (b) Write Bresenham circle drawing algorithm. Also explain mathematical foundation of it. [6]

**3.** (a) Explain the following terms with examples : [4]

- (1) Color gamut
- (2) Key-frame
- (3) Animation
- (4) Morphing.

(b) Explain 3D clipping with example. [4]

 (c) For origin centered unit square, rotate 45° clockwise, scale by a factor 2 in x-direction. Find resultant coordinates of square (write required matrices). [4]

#### Or

4. (a) Describe segment and explain any *three* operations carried out on it. [4]

- (b) Explain rotation about an arbitrary point in 2D. [4]
- (c) Explain 3D viewing transformation. [4]
- **5.** (a) Explain Backface Detection and removal. [4]
  - (b) Explain and compare point source and diffuse illumination. [5]
  - (c) Explain Phong Shading Algorithm. [4]

### Or

## 6. (a) Explain Binary Space Partitioning Algorithm with example.

[5]

- (b) Explain Gaurad Shading algorithm. [4]
- (c) Write a note on Phong Reflection Model. [4]
- [5252]-567

 $\mathbf{2}$ 

- Explain blending function for B-spline curve. [4] 7. (a)Explain architecture of *i*860. (*b*) [4] What is OpenGL ? Write *four* important features of the same. (*c*) Write any two 3D transformation functions of OpenGL. [5] Or *(a)* Write any *four* important features of NVIDIA gaming platform. 8. Explain need of NVIDIA workstation in gaming [5]
  - (b) Explain Hilbert curve with example. [4]
  - (c) Explain Koch curve with example. [4]

Seat	
No.	

# [5252]-568

## SE (Computer) (Second Semester) EXAMINATION, 2017 ADVANCED DATA STRUCTURES (2015 PATTERN)

## Time : Two Hours

## Maximum Marks : 50

- **N.B.** :- (i) Answer four questions
  - (ii) Figures to the right indicate full marks.
  - (iii) Assume suitable data, if necessary
- (a) From the given traversals construct the binary tree. [4] Pre-order : G, B, Q, A, C, K, F, P, D, E, R, H In-order : Q, B, K, C, F, A, G, P, E, D, H, R
  - (b) Find the MST for the graph given using Kruskals Algorithm and show all the steps. [4]



(c) Construct Huffman's Tree and the prefix free code for all characters : [4]

Symbol	A	C	E	Н	Ι
Frequency	3	5	8	2	7

- 2. (a) For the binary tree represented as an array, perform in-order threading on the tree : [4]
  1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
  A B C D E F G H I J K J K L L L
  - (b) Define DFS and BFS for a graph. Show BFS and DFS for the following graph with starting vertex as 1. [4]



- (c) Write pseudo-code for performing level order traversal ofa binary tree. [4]
- **3.** (a) Obtain AVL trees fro the following data : [6] 30, 50, 110, 80, 40, 10, 120, 60, 20, 70, 100, 90
  - (b) For the given set of values. [6]
    11, 33, 20, 88, 79, 98, 44, 68, 66, 22
    Create a hash table with size 10 and resolve collision using chaining with replacement and without replacement. Use the modulus Hash function. (key % size.)

 $\mathbf{2}$ 

- 4. (a)Find the Optimal Binary Search Tree for the : [6] Identifier set  $\{a1, a2, a3\} = \{do, if, while\}$ Where n = 3 and Probabilities of successful search as  $\{p1, p2, p3\} = \{0.5, 0.1, p3\}$ 0.05} and Probability of unsuccessful search as {q0, q1, q2,  $q3\} = \{0.15, 0.1, 0.05, 0.05\}.$ 
  - *(b)* What is hash function ? What are characteristics of good hash function ? Explain the different types of hash functions ? [6]
- 5. (a)Insert the following keys to a 5-ways B-tree : [6] 3, 7, 9, 23, 45, 1, 5, 14, 25, 24, 13, 11, 8, 19, 4, 31, 35, 56
  - (b)Create Min Heap (Binary) for 10, 12, 1, 14, 6, 5, 8, 15, 3, 9, 7, 4, 11, 13 After creating Min Heap delete element 1 from Heap and repair it.

Then insert element 20 and show final result.

(c)Define Red-Black Trees

### Or

- 6. State the need of B+ tree. Construct a B+ tree of order 5 (a)for the following data : [6] 30, 31, 23, 32, 22, 28, 24, 29, 15, 26, 27, 34, 39, 36
  - *(b)* What is priority queue ? Explain the insert and delete operations for priority queues using heap data structure.
  - (c)Define Splay trees. [2]

3

Or

[2]

[6]

[6]

- 7. (a) What is index sequential file organization ? State its advantages and disadvantages. [6]
  - (b) What is a File ? List different file opening modes in C++.Explain the concept of inverted files. [6]

- 8. (a) Write a C++ program to create a file. Insert records in the file by opening file in append mode. Search for a specific record entered by user. [6]
  - (b) Compare index sequential and direct access files. [6]

Seat	
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**Time : Two Hours** 

(iii) MOVS.

# [5252]-569

Maximum Marks : 50

# S.E. (Computer) (Second Semester) EXAMINATION, 2017 MICROPROCESSOR

## (2015 PATTERN)

# N.B. := (i) Solve Q. 1 or Q. 2; Q. 3 or Q. 4; Q. 5 or Q. 6;Q. 7 or Q. 8.

- (ii) Neat diagrams must be drawn wherever necessary.
- (*iii*) Figures to the right indicate full marks.
- (iv) Assume suitable data, if necessary.

1.	<i>(a)</i>	Explain immediate and register addressing mode with	an
		examples.	[2]
	( <i>b</i> )	Explain with example SHL and ROL instructions.	[4]
	( <i>c</i> )	Explain in detail the control registers of 80386.	[6]
		Or	
2.	( <i>a</i> )	Explain MSW.	[2]
	( <i>b</i> )	Explain paging mechanism.	[4]
	( <i>c</i> )	Explain the following instructions, mention flags affected:	[6]
		(i) LIDT	
		(ii) CLD	

- **3.** (a) What is CPL and RPL ? [2]
  - (b) Differentiate between memory mapped I/O and I/O mapped I/O. [4]
  - (c) Draw and briefly explain Task State Segment. [6] Or
- 4. (a) When does a page fault occur ? [2]
  - (b) Explain any two I/O privilege instructions. [4]
  - (c) Explain what happens when an interrupt calls a procedure as an interrupt handler. [6]
- 5. (a) What are the contents of various registers of processor 80386 after reset ? [3]
  - (b) How many debug registers are present in 80386 ? List and draw all of them. [4]
  - (c) With neat diagram explain the process of linear adress formationin V86 mode. [6]

- 6. (a) Write short note on "Instruction Address Breakpoint". [3]
  (b) What all initializations required to start processor in real mode after reset ? [4]
  (c) With neat diagram explain "Entering and leaving V86 mode".
  - (c) With neat diagram explain "Entering and leaving V86 mode". [6]

7.	<i>(a)</i>	Explain HOLD and HLDA signals of 80386DX.	[3]
	( <i>b</i> )	List various bus states when address pipelining is use	d. [4]
	( <i>c</i> )	Draw read cycle with non-pipelined address timing.	[6]
		Or	
8.	( <i>a</i> )	Explain the following signals : ( <i>i</i> ) NMI ( <i>ii</i> ) INTR ( <i>iii</i> ) RESET	[3]
	( <i>b</i> )	Draw and explain 80387 register stack.	[4]
	(c)	Draw 'write cycle with pipelined address timing'.	[6]

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No.	

# [5252]-570

# S.E. (Computer Engg.) (Second Semester) EXAMINATION, 2017 PRINCIPLES OF PROGRAMMING LANGUAGES (2015 PATTERN)

## **Time : Two Hours**

Maximum Marks : 50

**N.B.** :- (i) All questions are compulsory.

- (*ii*) Figures to the right indicate full marks.
- 1. (a) List the Programming paradigms. For any three state which programming languages are based on them and how ? [6]
  - (a) What are benefits of implementing built-in data types in programming languages ? State the built-in data types implemented by C++.
     [7]

Or

- (a) What is interpretation and translation process ? With neat diagram state the purpose of each activity in language processing with interpretation and translation. [6]
  - (b) What are abstract data types ? How C++ implements abstract data types ? Give example. [7]
- 3. (a) What are generic data structures and generic algorithms ? How C++ implements this generic programming constructs ? Give example of each.
  - (b) Justify the meaning of each characteristic of Java in the

statement "Java is simple, architecture neutral, portable, interpreted and robust and secured programming language". [6]

Or

- 4. (a) What are challenges for Programming in Large ? How these are addressed by programming languages ? [6]
  - (b) Write a program in Java to perform the addition of two matrices (multidimensional arrays) and set the diagonal elements of resultant matrix to 0.
- 5. (a) Explain the concept of dynamic dispatch while overriding method in inheritance. Give example and advantages of doing so. [5]
  - (b) Write a program in Java which defines Class CONVERSION which converts one unit of length into another using multiplying factor. This class has data members unit\_in, unit\_out and multiplier. When user creates object, constructor accepts value of multiplier and sets this for further conversion of units. The object uses methods to get value of unit\_in and output value of unit\_out and stores these in class variables. [8]

Or

- 6. (a) State two major differences in class and an interface.
   "Interface gives multiple inheritance facility just as in C++" justify. [7]
  - (b) State the use of the following constructs in Java with example: [6]
    - (1) final method declaration in super class while inheritance
    - (2) abstract class declaration
    - (3) method overriding.

- 7. (a) Define the term exception. State the advantage of exception handling. What are types of exceptions ? [6]
  - (b) State the use of the following methods for programming applet.
    Give example of using each of these, init(), start(), paint(), stop(), destroy(), update(). [6]

- 8. (a) What is difference between byte streams and character streams? Demonstrate the use of console class to get inputs and show results. [6]
  - (b) Write a program in Java to calculate the value of ((x + y)/((x y))). Program should prevent the condition x y = 0.

[6]

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No.	

# [5252]-571

# S.E. (Infor. Tech.) (First Semester) EXAMINATION, 2017 DISCRETE STRUCTURES

## (2015 PATTRN)

### **Time : Two Hours**

#### Maximum Marks : 50

- N.B.: (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.

 (a) Suppose that a department contains 10 men and 15 women. How many ways are there to form a committee with six members if it must have the same number of men and women ?

- (b) Show that  $\neg (p \leftrightarrow q)$  and  $p \leftrightarrow \neg q$  are logically equivalent. [6] Or
- 2. (a) Suppose that Gopal selects a ball by first picking one of two boxes at random and then selecting a ball from this box at random. The first box contains two white balls and three blue balls, and the second box contains four white balls and one blue ball. What is the probability that Gopal picked a ball from the first box if he has selected a blue ball ? [6]
  - (b) Prove that  $1^1 + 2^2 + ... + n^2 = n(n + 1)(2n + 1)/6$  for the positive integer n using mathematical induction. [6]

- 3. (a) Use Warshall's algorithm to find transitive closure of the following relation on the set {1, 2, 3, 4},
  R = {(1, 2,), (1, 3), (1, 4), (2, 3), (2, 4), (3, 4)} [6]
  - (b) Draw the graph and its equivalent Hasse diagram for divisibility on the set : [6]

$$\{1, 2, 3, 6, 12, 24, 36, 48\}$$

- 4. (a) Find inverse function of the function  $y = 1 x^2$ . [6]
  - (b) Determine the chromatic number of following graphs : [6]





- 5. (a) Suppose 1000 people enter a chess tournament. Use a rooted tree model of the tournament to determine how many games must be played to determine a champion, if a player is eliminated after one loss and games are played until only one entrant has not lost. (Assume there are no ties). [7]
  - (b) How many leaves does a full 3-ary tree with 40 vertices have?Illustrate with suitable diagram. [6]

6. (a) What is prefix-free code ? Which of these codes are prefix-free codes ? [7]

(i) a : 0, e : 1, t : 01, s : 001

(*ii*) a : 101, e : 11, t : 001, s : 011, n : 010

(b) Determine the order in which preorder, inorder and postorder traversal visit the vertices in given ordered tree. [6]



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7. (a) Find the number of code generated by given check matrixH. Also find all codeword generated. [7]

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 \end{bmatrix}$$

- (b) Define the following with suitable example : [6]
  - (*i*) Group
  - (*ii*) Monoid;
  - (*iii*) Abelian group.

#### Or

- 8. (a) Let R = {0°, 60°, 120°, 180°, 240°, 300°} and \* = binary operation, so that for a and b in R, a \* b is overall angular rotation corresponding to successive rotations by a and then by b. Show that (R, \*) is a Group. [7]
  - (b) G = {0, 1, 2, 3, 4, 5, 6, 7) and operation is '+8' addition modulo 8, then (G, +8) is an abelian group. [6]

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No.	

# [5252]-572

# S.E. (Information Technology) (First Semester) EXAMINATION, 2017 COMPUTER ORGANIZATION AND ARCHITECTURE

(2015 COURSE)

## Time : Two Hours

Maximum Marks : 50

**N.B.** :- (i) All questions are compulsory.

(ii) Figures of the right indicate full marks.

- 1. (A) Multiply 101011 by 110011 using Booth's algorithm. [6]
  - (B) Explain any *two* addressing modes with suitable diagrams and example. [6]

### Or

- 2. (A) Which are the different instruction cycle states of a processor ? Explain. [6]
  - (B) Perform the division using non-restoring method 22/3. [6]
- **3.** (A) Explain Single Bus Processor Organization with diagram. [7]
  - (B) Explain any one type of cache mapping technique with diagram. [6]

What are the functions of control unit ? Explain control unit

- with block diagram. [7](B) How virtual memory is managed using paging and TLB ? [6] 5. Which are the different stages in 5 stage pipeline ? (A) [6] (B) Explain events of Fetch cycle of MIPS pipeline. [6] Or 6. (A) What are the Hazards in pipeline architecture ? Explain its types. [6] Which are the basic performance issues in pipelining ? [6] (B) 7. (A) Write short note on cluster configuration. [6] Write a note on Multicore Architectures. (B) [7]OrExplain closely coupled and loosely coupled microprocessor 8. (A) systems. [7]
  - (B) What is Flynn's Taxonomy for Multiprocessor Organizations?Explain with diagram. [6]

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4.

(A)

 $\mathbf{2}$ 

Time : Two Hours

[Total No. of Printed Pages-2]

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## [5252]-573

Maximum Marks : 50

# S.E (Information Technology) (I Sem.) EXAMINATION, 2017 DIGITAL ELECTRONICS AND LOGIC DESIGN (2012 COURSE)

**N.B.** :- (*i*) Answer Question 1 or 2, 3 or 4, 5 or 6 and 7 or 8

- (ii) Neat diagrams must be drawn wherever necessary.
- (*iii*) Figures to the right indicate full marks.
- (*iv*) Assume suitable data if necessary.
- 1. (a) Explain the standard TTL characteristics in detail. [6]
  - (b) Convert the following binary numbers to octal then to decimal.Show the steps of conversions. [6]
    - (*i*) 11011100.101010
    - (*ii*) 01010011. 010101
    - (*iii*) 10110011

## Or

- (a) Draw and explain 4 bit Excess-3 adder using IC 7483. Also explain with example addition of numbers with carry. [6]
  - (b) Minimize the following function using K-map and implement using basic logic gates. [6]

$$f(A,B,C,D) = \Sigma m (1,3,5,8,9,11,15) + d(2,13)$$

- (a) Expalin the working of magnitude comparator using IC 7485
   Choose suitable imputs. [6]
  - (b) Design 12: 1 Mux using 4:1 multiplexer (with enable inputs).Explain the truth table of your circuit in short. [6]

- 4. (a) Explain with a neat diagram working of parallel in serial out 4-bit shift register. Draw necessary timing diagram. [6]
  - (b) What is Mod counter ? Explain MOD-26 counter using IC 7490.Draw design for the same. [6]
- 5. (a) What is ASM chart ? Draw ASM chart for 3-bit up-down counter. [6]
  - (b) Explain the basic architecture of FPGA. [7]

- 6. (a) Define PLD. Implement the following function using PAL F (A,B,C,D) = Sm (0,1,3,15) [6]
  - (b) Differentiate between CPLD and FPGA. [7]
- 7. (a) Explain Process statement in behavior method of VHDL with respect to syntax, declarative part and statement part. [6]
  - (b) What is difference between concurrent and sequential statements in VHDL. [7]

#### Or

- 8. (a) What is difference between signal and variable in VHDL ? Explain with example. [6]
  - (b) Write a VHDL structural code for 4:1 multiplexer shown in figure. [7]



Seat	
No.	

# [5252]-574

# S.E. (IT) (First Semester) EXAMINATION, 2017 FUNDAMENTALS OF DATA STRUCTURES

## (2015 **PATTERN**)

## **Time : Two Hours**

## Maximum Marks : 50

- **N.B.** :- (i) Answer four questions.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right side indicate full marks.
  - (iv) Assume suitable data if necessary
- (a) Write the difference between while and for loop in C language. [6]
  - (b) Explain call by value and call by reference with suitable example.[6]

#### Or

- **2.** (a) Differentiate between Text file and Binary file. [4]
  - (b) What is recursion ? Explain with example. [4]
  - (c) Explain various operators in C. [4]

## **3.** (*a*) Define :

- (1) Data and Data object
- (2) Data structure
- (3) Abstract Data Types
- (b) Write algorithm to sort a list of integers using bubble sort. Show output of each pass for the following list : 10, 5, 4, 18, 17, 1, 2.

P.T.O.

[6]

- 4. (a) Differentiate between the following : [6]
  - (1) Internal sorting and External sorting
  - (2) Linear and Binary searching
  - (b) Differentiate between the following : [6]
    - (1) Primitive and Non-primitive data structures
    - (2) Linear and Non-linear data structures
- 5. (a) Explain simple and fast transpose of a sparse matrix with example. Also write fast transpose c function for sparse matrix.
  - (b) Explain the concept of row major and column major address calculation for multidimensional array using example. [6]

- 6. (a) Explain row and column major representation of a matrix with example. [6]
  - (b) Represent the following polynomial using array : [8] (i)  $X^2 + 13XY^4 + 2X^3Y^3 + 15Y$ 
    - $(ii) \quad 3 \ {\rm X}^3 \ + \ 2{\rm Y}^2{\rm X} \ + \ 5{\rm Y}^3{\rm X}^3 \ + \ 17$
- 7. (a) Write short notes on :
  - (1) CLL
  - (2) DLL
  - (3) SLL
  - (4) Skip list [8]
  - (b) Write a 'C' function to reverse a singly linked list using three pointer. [4]

Or

- 8. (a) What is generalized linked list ? Represent the following lists : [8]
  - (1) (a, b, c(d, e, f), g, h)
  - (2) (p (q, r), s, (t, u), v)
- (b) Differentiate between sequential and linked organization. [4]

[Total No. of Printed Pages-3

Seat	
No.	

# [5252]-575

Maximum Marks : 50

S.E. (Information Technology) (I Semester) EXAMINATION, 2017 PROBLEM SOLVING AND OBJECT ORIENTED PROGRAMMING CONCEPTS

## (2015 PATTERN)

Time : 2 Hours

- N.B. :- (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.
- 1. (a) What are the six steps of problem solving ? [6]
  - (b) State the major differences in the three types of loop structures.

[6]

Or

- 2. (a) When should you use single decision logic over nested decision logic ?[6]
  - (b) What are the relationships of the problem-solving tools to each other ?[6]

- **3.** (a) Write an algorithm to find the maximum in an array and the position : [4]
  - (*i*) where it first occurs
  - (*ii*) where it last occur.
  - (b) Write a C++ program to calculate the area of circle, rectangle and triangle using function overloading. [4]
  - (c) Write alogrithm for keyword searching. [4]

- **4.** (a) Write a C++ program to overload unary operator minus(-). [4]
  - (b) Explain the syntax of operator overloading using friend function.
    [4]
  - (c) What do you mean by dynamic initialization of object ? [4]
- 5. (a) What is static data member and static member function? Write its properties. [6]
  - (b) Explain constructors and destructors in inheritance. [4]
  - (c) Write a program to demonstrate how constructor and destructor are invoked in multilevel inheritance. [3]

#### Or

- 6. (a) Differentiate between Procedural Oriented Programming and Object-oriented Programming. [6]
  - (b) Explain early binding and late binding. [4]
  - (c) What is inheritance ? Write types of inheritance. [3]

## [5252]-575

 $\mathbf{2}$ 

7.	( <i>a</i> )	Explain Standard Template Library (STL).	
	( <i>b</i> )	Write a C++ program to swap two numbers using con	cept
		of function template.	[4]
	( <i>c</i> )	How to catch multiple exceptions ?	[3]
		Or	
8.	( <i>a</i> )	Write a note on RTTI.	[6]

- (b) What is exception handling mechanism in C++ ? Write a program in C++ to handle "divide by zero" exception. [4]
- (c) How to Manage console I/O operations ? [3]

Seat No.

# [5252]-576

# S.E. (Information Technology)(Second Semester) EXAMINATION, 2017 COMPUTER GRAPHICS (2015 PATTERN)

## **Time : Two Hours**

## Maximum Marks : 50

- **N.B.** :- (i) Neat diagram must be drawn wherever necessary.
  - (ii) Figures to the right indicate full marks.
  - (iii) Assume suitable data, if necessary.
- (a) Derive equation for decision parameter of Bresenham's circle algorithm. [6]
  - (b) What are the different steps for rotation about an arbitrary point in 2D ? [6]

Or

- (a) Interpret Bresenham's algorithm to find which pixels are turned on for the line segment between (1, 2) and (7, 6). [6]
  - (b) Write pseudo code for Boundary fill algorithm. Compare boundary fill algorithm with scan line algorithm. [6]

3. (a) Explain with the help of suitable diagram parallel and perspective projection. [6]

(b) Explain Midpoint subdivision line clipping method with suitable example. [6]

4.	<i>(a)</i>	Explain basic transformations on 3D. [6	6]
	( <i>b</i> )	What is segment ? Explain the concept of segment tabl	le
		and display file. [6	6]
5.	<i>(a)</i>	Explain in detail Graphics memory pipeline.	7]
	( <i>b</i> )	Explain pseudo C Algorithm for Gourad Shading.	6]
		Or	
6.	<i>(a)</i>	Draw and explain block diagram of i860 microprocessor.[7]	]
	( <i>b</i> )	What is animation ? Explain the basic rules required for	or
		Animation.	6]
7.	( <i>a</i> )	Write the properties of Bezier and B-spline curves.	7]
	( <i>b</i> )	Why cubic Bezier curves are chosen ? Explain any Bezier curv	<b>'</b> e
		generation method.	6]
		Or	
8.	( <i>a</i> )	Explain how Koch curves are generated. Also calculate th	e
		fractal dimension of Koch curve. [7	7]
	( <i>b</i> )	Define fractals with examples. Give various categories in which	h
		fractals are classified.	6]

[Total No. of Printed Pages-2

Seat	
No.	

# [5252]-577

# S.E. (Information Technology) (Second Semester) EXAMINATION, 2017 PROCESSOR ARCHITECTURE AND INTERFACING (2015 PATTERN)

## Time : Two Hours

# Maximum Marks : 50

- **N.B.** :- (i) Neat diagrams must be drawn wherever necessary.
  - (*ii*) Figures to the right indicate full marks.
  - (*iii*) Assume suitable data, if necessary.
- (a) Explain how to convert .asm to .exe. Explain the necessary tools required for the same. [7]
  - (b) What is Privileged Instruction ? Explain two examples of privileged instructions. What is the Privilege Level when 80386 is operating in Real Mode and Protected Mode. [5]

#### Or

- 2. (a) How linear address is converted into the Physical Address?When 80386 is operating in Protected Mode ? Explain. [7]
  - (b) Explain difference between Macro and Procedure with examples.[5]

- **3.** (a) Explain Internal Memory Structure of 8051. [5]
  - (b) What do you mean by IDT of 80386 ? Which are different types of descriptors present in IDT ? Give difference in handling Interrupts using different types of descriptors present in IDT.

- 4. (a) List features of 8051 Microcontroller. Compare Microcontroller with Microprocessor. [5]
  - (b) Explain significance of Backlink field in 80386. Explain multitasking in 80386 with diagram. [7]
- 5. (a) Explain significance of various ports [P<sub>0</sub> to P<sub>3</sub>] in 8051. [7]
  (b) Explain significance of PSW and TCON with format. [6]
  Or
- 6. (a) Explain Interrupt structure of 8051 with diagram. [7]
  (b) Explain any two Operating Modes of Timer in 8051. [6]
- 7. (a) How to configure Port 0 of Port 1 for 2 digit seven segment display ? Explain with diagram and instruction. [7]
  - (b) Draw interfacing diagram of ADC with 8051. Explain [6] Or
- 8. (a) Draw interfacing diagram of 8051 with external data memory as  $4K \times 8$  and external program memory as  $2K \times 8$ . [7]
  - (b) Draw and explain functional block diagram of 8255. [6]
- [5252]-577

 $\mathbf{2}$ 

Seat	
No.	

# [5252]-578

# S.E. (I.T.) (Second Semester) EXAMINATION, 2017 DATA STRUCTURES AND FILES (2015 PATTERN)

# Time : Two Hours

Maximum Marks : 50

- **N.B.** :- (i) Answer four questions.
  - (*ii*) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (iv) Assume suitable data, if necessary.
- 1. (a) Convert the following infix expressions to postfix expression using stack : [6]

$$((A+B)*C-(D-E) \land (F+G))$$

(b) Write a non-recursive algorithm to find the post-order traversal of a binary tree. [6]

#### Or

2. (a) Imagine that the content of queue Q1 & Queue Q2 are as shown. What would be the content of Q3 after the following code is executed ? Show pictorial representation of both Q1 & Q2 with value of front & rear. The queue contents are shown front (left) to rear (right). [6] Q1 : 42 30 41 30 19 20 25 14 10 11 12 15 Q2 : 3 5 7 4 13
1. Q3 = createQueue()

- 2. count = 0
- 3. loop (not empty Q1 and not empty Q2)
  - 3.1. count = count + 1
  - 3.2. dequeue(Q1, x)
  - 3.3. dequeue(Q2, y)
  - 3.4 if (y equal count)
  - 3.4.1. enqueue(Q3, x)
  - 3.5. end if
- 4. end loop.
- (b) Draw the BST for the following given nodes and write recursive algorithm for the following operations on it 45, 7, 21, 76, 1, 54, 22, 4, 86 :
  - (i) To search a data,(ii) Height of a tree. [6]
- **3.** (a) What is graph ? Explain Graph representations with example.
  - [6] Construct the Huffman tree for the following data : [6]

Data	Frequency
Р	18
Q	8
R	15
S	2
Т	25
U	13
V	5
W	26

*(b)*
Or

- Sort the given list of elements using heap sort : 4. (a)[8] 14, 12, 9, 8, 7, 10, 18 Using the modulo-division method and linear probing without *(b)* replacement, store the keys shown below in an array with 19 elements. How many collisions occurred : 224562, 137456, 214562, 140145, 214576, 162145, 144467, 199645, 234534. [4]5. Explain threaded binary tree with example. [4](a)Construct an AVL for the following data : *(b)* MAR, MAY, NOV, AUG, APR, JAN, DEC, JUN, FEB, JUL, OCT, SEP. Show the balance factor of each node and rotation. [10]Or **6**. Construct red black tree for given list of numbers : (a)2, 1, 4, 5, 9, 3, 6, 7.[8] (b)Write a short note on B Tree and Splay Tree. [6] 7. (a)Write C++ program to copy one file content into another file. [4] Explain Primitive operations on Index Sequential Files in *(b)* detail. [8] Or 8. What is file ? Explain different types of file organizations. (a)[6]
  - (b) Write C++ pseudo code for modify and delete operation on sequential files. [6]

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[5252]-578
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3

Total No. of Questions-8]

Seat	
No.	

**Time : Two Hours** 

# [5252]-579

Maximum Marks : 50

# S.E. (IT) (Semester-II) EXAMINATION, 2017 FOUNDATIONS OF COMMUNICATION AND COMPUTER NETWORK (2015 PATTERN)

# **N.B.** :- (i) Answer Question Nos. 1 or 2, 3 or 4, 5 or 6, 7 or 8. (ii) Figures to the right indicate full marks.

(iii) Assume suitable data, if necessary.

- (a) List the different propagation modes in fiber. Also draw a neat diagram to show total internal reflection phenomena in optical fiber. [6]
  - (b) Draw time domain representation of AM wave. A carrier of 1000 W is modulated with a resulting modulation index of 0.8. What is the total power ?

#### Or

- 2. (a) The power of a signal is 10 mW and the power of the noise is 1  $\mu$ W. What are the values of SNR and SNR<sub>dB</sub>? [6]
  - (b) Draw frequency domain representation of AM wave. A stadard AM broadcast station is allowed to transmit modulating frequencies upto 5 kHz. If the AM station is transmitting on a frequency of 980 kHz, what are sideband frequencies and total bandwidth ? [6]

3.	<i>(a)</i>	Explain	the	following	$\mathbf{shift}$	keying	Techniques	with	suitable
		example	s:						

- (i) ASK
- (ii) FSK
- (iii) PSK[7]

(b) What is CRC? Generate the CRC code for message 1101010101. Given generator Polynomial  $g(x) = x^4 + x^2 + 1$ . [6]

#### Or

- 4. (a) Draw and explain PCM and DM. [7]
  - (b) Explain in detail Go-Back-N & Selective Repeat ARQ System.[6]
- 5. (a) Write a short note on CSMA/CD. How is it useful for collision avoidance?
  - (b) Explain Statistical TDM and Synchronous TDM techniques.

[6]

#### Or

- 6. (a) Compare FDMA, CDMA, TDMA. [6]
  - (b) Explain the various controlled access methods. [6]
- 7. (a) Compare and contrast circuit switched network with packet switched network. [6]
  - (b) Compare 100BASE-TX, 100BASE-FX, 100BASE-T4. [7] Or
- 8. (a) Explain types of bridges with suitable diagram. [6]
  - (b) Explain the frame format for IEEE 802.3. [7]

Total No. of Questions-8]

[Total No. of Printed Pages-3

Seat	
No.	

### [5252]-581

### SE (Chemical) (First Semester) EXAMINATION, 2017 CHEMISTRY—I

#### (2015 PATTERN)

Time : Two Hours

### Maximum Marks : 50

- **N.B.** :- (i) Neat diagrams must be drawn wherever necessary.
  - (*ii*) Figures to the right indicate full marks.
  - (*iii*) You are advised to attempt not more than **4** questions.
  - (*iv*) Use of logarithmic table slide rule, Mollier charts, electronic pocket calculator and steam tables are allowed.
  - (v) Assume suitable data, if necessary.
- 1. (a) Derive the integrated rate equation for first order reaction and explain its characteristics. [6]
  - (b) Draw, describe molecular orbital diagram and find the bond order for CO molecule. [6]

#### Or

- 2. (a) Define the following terms with example : [6]
  (i) Rate of reaction and rate constant
  (ii) Order and molecularity of reaction.
  (b) Give reasons : [6]
  (i) Acetic acid is weaker than monochloroacetic acid
  (ii) P-methoxy phenol is weaker acid than phenol
  (iii) Pyridine is weaker base than pyrrole.
- **3.** (a) State and derive the Lambert and Beer law equation. [5] P.T.O.

- (b) Define and explain :
  - (i) Raoult's law
  - (ii) Henry's law.
- (c) A solution containing 0.51 gm napthalene in 50 gm of CCl<sub>4</sub> gives elevation in boiling point is 0.402°C, 0.62 gm of unknown solute is same mass of solvent gives elevation in boiling point is 0.64°C. Calculate molar mass of unknown solute.
   (Given molar mass of Napthalene = 128 gm/mole) [4]

[4]

#### Or

4. (a) Derive the thermodynamic equation for depression in freezing point of solution. [5]
(b) Explain the principle and technique of column chromatography. [4]
(c) What are the different electronic transitions in molecules on absorption of UV radiations. [4]

- (*i*) Aniline  $\operatorname{con. H_2SO_4}$
- $\begin{array}{ccc} (ii) & \mathrm{C_6H_6} & \xrightarrow{\mathrm{Acetic}} & & \\ & & \text{anhydride} & \\ (iii) & \mathrm{C_6H_5N_2Cl} + & \mathrm{C_6H_5OH} & \xrightarrow{\mathrm{H^+}} & \\ \end{array}$
- (b) Explain the mechanism of  $\varepsilon_1$  and  $\varepsilon_2$  reaction. [6]

#### Or

6. (a) Write short notes on : [6]
(i) Reformatsky reaction
(ii) Claisen rearrangement.
(b) Give the mechanism Favoskii rearrangement. [6]

7.	( <i>a</i> )	Give any <i>two</i> methods for synthesis of Furan.	[4]
	( <i>b</i> )	Explain molecular orbital picture of pyridine.	[5]
	( <i>c</i> )	Explain the preparation of crystal violet.	[4]

#### Or

**8.** (*a*) Explain the classification of dyes on the basis of applications. [5]

[4]

[4]

- (b) Define the terms :
  - (*i*) Chromophore
  - (*ii*) Auxochromophore

(iii) Bathochromic shift

- (*iv*) Hypsochromic shift.
- (c) Predict the product :

Total No. of Questions-8]

Seat	
No.	

# [5252]-582

### S.E. (Chemical) (First Semester) EXAMINATION, 2017 FLUID MECHANICS (2015 PATTERN)

### Time : Two Hours

### Maximum Marks : 50

- N.B. :- (i) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 and Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (v) Assume suitable data, if necessary.
- 1. (a) Explain Newton's law of viscosity. Distinguish between Newtonian and non-Newtonian fluids. Give two examples of each. [6]
  - (b) A differential manometer is connected at the two points A and B of two pipes as shown in Fig. The pipe A contains a liquid of sp. gr. = 1.5 while pipe B contains a liquid of sp. gr. = 0.9. The pressures at A and B are 1 kgf/cm<sup>2</sup> and 1.80 kgf/cm<sup>2</sup> respectively. Find the difference in mercury level in the differential manometer. [6]



- 2. (a) A flat plate of area 1.5 × 10<sup>6</sup> mm<sup>2</sup> is pulled with a speed of 0.4 m/s relative to another plate located at a distance of 0.15 mm from it. Find the force and power required to maintain this speed, if the fluid separating them is having viscosity as 1 poise. [6]
  - (b) Differentiate between : [6]
    - (i) Absolute and gauge pressure
    - (ii) Simple manometer and differential manometer
    - (iii) Piezometer and pressure gauges.
- 3. (a) Explain the following of fluid flow : [6]
  (i) Steady and unsteady state flow
  (ii) Uniform and non-uniform flow
  (iii) Rotational and irrotational flow.
  - (b) Prove that the maximum velocity in a circular pipe for viscous flow is equal to two times the average velocity of the flow. [7]

#### Or

- 4. (a) What is Hagen Poiseuille's formula ? Derive an expression for
   Hagen Poiseuille's formula. [7]
  - (b) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of oil of sp. gr. 0.8. The discharge of oil through ventrimeter is 60 litres/sec. Find the reading of the oil-mercury differential manometer. Take  $C_d = 0.98$ . [6]

5. (a) What do you mean by : [8]
(i) dimensionally homegeneous equation and
(ii) dimensionally non-homogeneous equation ?
Give two examples of each. List out the uses of dimensional

analysis.

- (b) Define the following thicknesses of boundary layer : [5]
  - (i) Nominal thickness
  - (ii) Displacement thickness
  - (iii) Momentum thickness
  - (*iv*) Energy thickness.

#### Or

6. (a) The resistance R of a supersonic plane during the flight depends upon the lengths of aircraft *l*, the velocity of plane V, air viscosity μ, density of air ρ, and bulk modulus of elasticity K. By Buckingham's π theorem, show that : [7]

$$\mathbf{R} = \rho l^2 \mathbf{V}^2 \phi \left( \frac{\mu}{\rho \mathbf{VL}}, \frac{\mathbf{K}}{\rho \mathbf{V}^2} \right)$$

(b) Explain the factors affecting thickness of boundary layer. [6]

- 7. (a) Explain operating characteristics of centrifugal pump. [6]
  - (b) Define the following dimensionless numbers and explain their significance in fluid mechanics : [6]
    - (i) Reynolds' number

- (ii) Froude number
- (iii) Euler number
- (iv) Mach number
- (v) Weber number.

### Or

8.	<i>(a)</i>	Explain the Rayleigh	method	and	Buckingham's	π	method	of
		dimensional analysis.						[6]
	<b>/7</b> \		<b>a</b>				• .	

(b) Explain phenomenon of cavitation in pumps. How can it be prevented ? [6]

Total No. of Questions-8]

Time : Two Hours

[Total No. of Printed Pages-2

Seat	
No.	

# [5252]-583

### S.E. (Chemical) (First Semester) EXAMINATION, 2017 ENGINEERING MATERIALS

#### (2015 PATTERN)

**N.B.** :— (i) Neat diagrams must be drawn wherever necessary.

 (*ii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(iii) Assume suitable data, if necessary

Hardness Testing.

- (*i*) Malleability
- (*ii*) Ductility
- (*iii*) Resilience
- (*iv*) Toughness.

(ii)

(b) Draw and explain stress-strain curve for ductile materials.

[4]

#### Or

2.	( <i>a</i> )	Explain in brief mechanical properties of materials.	[6]
	( <i>b</i> )	Write short notes on :	[6]
		(i) ASTM Methods	

P.T.O.

# Maximum Marks : 50

[8]

3.	( <i>a</i> )	Write a short note on Durometers. [6	3]
	( <i>b</i> )	Explain Rockwell Hardness of materials. Draw a neat sketch.[7	7]
		Or	
4.	( <i>a</i> )	Write short notes on the following : [6	3]
		( <i>i</i> ) Carbon nanotubes	
		( <i>ii</i> ) Bucky balls	
	( <i>b</i> )	Write short notes on the following : ['	7]
		( <i>i</i> ) Welding	
		( <i>ii</i> ) Rolling	
		( <i>iii</i> ) Riveting	
5.	Writ	e short notes on : [13	3]
	( <i>i</i> )	X–ray diffraction	
	( <i>ii</i> )	Scanning Tunneling microscopy	
		Or	
6.	Expl	ain principle and working of Transmission Electron Microscop	)e
	(TEN	<b>I</b> ) ?	3]
7.	Writ	e short notes on : [12	2}
	( <i>i</i> )	Mechanical properties of ceramic	
	( <i>ii</i> )	Applications of ceramic material	
	( <i>iii</i> )	Cement	

### Or

8. (a) Write down different applications of Glass materials. [6]
(b) Discuss in detail applications of Ceramic materials. [6]

[5252]-583

 $\mathbf{2}$ 

Total No. of Questions-8]

Seat	
No.	

### [5252]-584

S.E. (Chemical) (First Semester) EXAMINATION, 2017 PROCESS CALCULATIONS

#### (2015 **PATTERN**)

#### **Time : Two Hours**

### Maximum Marks : 50

- N.B. :- (i) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right indicate full marks.
  - (*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic, pocket calculator and steam tables is allowed.
  - (v) Assume suitable data, if necessary.
- 1. (a) Describe the following terms : [4]
  - (1) Weight Percent
  - (2) Volume Percent
  - (3) Mole Percent
  - (4) Mole Fraction.
  - (b) A gas mixture containing 15 mole % A and 85 mole % inerts is fed to an absorption tower where it is contacted with liquid solvent B which absorbs A. The mole ratio of solvent to gas

entering tower is 2:1. The gas leaving the absorber contains 2.5% A, 1.5% B and the rest inerts (on mole basis). Find :

- (1) The percentage recovery of solute A
- (2) The fraction of solvent B fed to the tower lost in gas leaving the tower.
- Note : During the process, some solvent evaporates and gets added in the gas leaving the tower. [8]
- **2.** (a) Explain classification of Material balance problem [4]
  - (b) A closed vessel contains a mixture of 40%  $NO_2$  and 60%  $N_2O_4$ at a temperature of 311 K and a pressure of 531.96 kPa. When the temperature is increased to 333 K, some of  $N_2O_4$ dissociates to  $NO_2$  and a pressure rises to 679.95 kPa. Calculate the composition of the gases at 333 K by weight. [8]
- 3. (a) A sample of petrol contains 15% H<sub>2</sub> and 85% C by weight. Calculate the amount of air required for the complete combustion of 1 kg of petrol. Find the composition of dry products on volume basis if 15% excess air is supplied. [7]
  - (b) Calculate the amount of heat given off when 1 m<sup>3</sup> of air at standard condition cools from 600°C to 100°C at constant pressure :

$$C_p$$
 (air) = 6.386 + 1.762 × 10<sup>-3</sup> T-0.2656 × 10<sup>-6</sup> T<sup>2</sup>  
 $C_p$  is in kcal/kmole K and T in K. [6]

4. (a) Methane gas is heated from 303 K to 523 K at atmospheric pressure. Calculate the heat added per kmol methane using  $C_p$  data

Data :  $C_p = a + bT + cT^2 + dT^3$ 

Gas	a	b×10 <sup>3</sup>	c×10 <sup>6</sup>	d×10 <sup>9</sup>	
Methane	19.2494	52.1135	11.973	-11.3173	[8]

**5.** (a) Define the following :

- (*i*) Absolute humidity
- (*ii*) Molal humidity
- (*iii*) Percent humidity
- (*iv*) Wet bulb temperature
- (v) Adiabatic saturation temperature
- (vi) Dry bulb temperature.
- (b) A mixture of benzene and dry air at a temperature of 303
   K and pressure of 101.325 kPa is found to have a dew point of 288 K. Calculate : [7]
  - (i) The precentage by volume of benzene
  - (ii) The mole of benzene per mole dry air.

3

#### [5252]-584

#### Or

P.T.O.

[6]

- [(

6. (a) Liquid paraffin wax is crystallized in a continuous jacketed crystallizer. For a particular run the data is as follows : Liquid paraffin fed = 675 kg/h, inlet temperature = 332 K, outlet temperature = 320 K, Mean heat capacity = 2.93 kJ/kg K, Latent heat of crystallization = 168.7 kJ/kg, Crystallization temperature = 320 K, Power input at shaft = 17 kW, Cooling water flow in the jacket = 1.92 lps, rise in jacket water temperature = 5.8 K. Assuming no radiation losses calculate the mass flow rate of crystals and the percentage crystallization.

[8]

- (b) Define relative humidity and percentage humidity and derive a relation between them. [5]
- 7. (a) Crude oil is found to contain 87.1% carbon, 12.5% hydrogen and 0.4% sulphur (by mass). Its GCV at 298.15 K is measured to be 45071 kJ/kg oil. [6]
  - (i) Calculate its NCV at 298.15 K and
  - (*ii*) Give complete analysis of flue gases.
  - Data : Latent heat of water vapour at 298.15 K = 2442.5 kJ/kg.
  - (b) Define : [6]
    - (1) Adiabatic flame temperature
    - (2) Theoretical air
    - (3) Excess air.

The coal having the ultimate analysis (Carbon = 61.5%, Hydrogen = 3.5%, Sulphur = 0.4%, Nitrogen = 1.8%, Ash = 14.2% and rest oxygen.

Calculate :

8.

[12]

- (1) Theoretical oxygen requirement per unit weight of coal kg/kg
- (2) The theoretical dry air requirement per unit weight of coal kg/kg
- (3) The Orsat analyses of flue gases when the coal is burnt with 90% excess dry air.

Total No. of Questions-8]

Seat	
No.	

### [5252]-585

Maximum Marks : 50

# S.E. (Chemical) (First Semester) EXAMINATION, 2017 ENGINEERING MATHEMATICS—III

#### (2015 **PATTERN**)

Time : Two Hours

- N.B. :- (i) Solve Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.
  - (ii) Neat diagrams should be drawn wherever necessary.
  - (*iii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (iv) Assume suitable data, if necessary.
- 1. (a) Solve any two: [8]
  - (*i*)  $(D^3 + 4D) y = \sin 2x$
  - (*ii*)  $x^2 \frac{d^2 y}{dx^2} 2x \frac{dy}{dx} 4y = x^2$
  - (*iii*)  $(D^2 + 4)y = \sec 2x$  (by method of variation of parameters).

(*b*) Find the Fourier transform of :

$$f(x) = \begin{cases} \sin x, & 0 < x < \pi \\ 0, & x < 0 \text{ or } x > \pi \end{cases}$$

- Or
- 2. A 1 kg weight, suspended from a spring stretches it 4 cm. (a)If the weight is pulled down 8 cm below the equilibrium position and then released. Find the displacement of the body from its equilibrium position in time 't' seconds and period of oscillation. [4]

(b) Find the Fourier sine integral representation of : [4]  
$$f(x) = e^{-mx} (m > 0, x > 0).$$

$$(c)$$
 Solve the integral equation :

$$\int_0^\infty f(x) \cos \lambda \, x dx = \begin{cases} 1 - \lambda, \, 0 \le \lambda \le 1 \\ 0, \, \lambda \ge 1 \end{cases}$$

Find the Laplace transform of (any one) : 3. (a)[4]

(*i*) 
$$F(t) = \begin{cases} \cos\left(t - \frac{2\pi}{3}\right); & t > \frac{2\pi}{3} \\ 0; & t < \frac{2\pi}{3} \end{cases}$$

(ii) 
$$f(t) = \int_0^t \frac{e^t \sin t}{t} dt.$$

Find the inverse Laplace transform of : (*b*) [4]

•

$$F(s) = \frac{s+2}{2s(s+1)(s+3)}$$

[5252]-585

[4]

[4]

(c) Find the directional derivative of the function :

$$Q = 6x^2y + 24 y^2z - 8 z^2x$$

at (1, -1, 1) in the derection parallel to the line

$$\frac{x+1}{2} = \frac{y+3}{-2} = \frac{z}{1}.$$
 [4]

4. (a) Prove the following (any one) : [4]

(i) 
$$\nabla \cdot \left(\frac{\log r}{r} \xrightarrow{r}\right) = \frac{1}{r} (1+2\log r)$$

(*ii*) 
$$\nabla\left(\frac{\overline{a}.\overline{r}}{r^3}\right) = \frac{\overrightarrow{a}}{r^3} - \frac{3(\overrightarrow{a}.\overrightarrow{r})}{r^5}\overrightarrow{r}$$

(b) If the vector field :

$$\overrightarrow{F} = (x+2y+az)\overrightarrow{i} + (bx-3y-z)\overrightarrow{j} + (4x+cy+2z)\overrightarrow{k}$$

is irrotational, find *a*, *b*, *c* and also scalar function  $\phi$  such that  $\overrightarrow{F} = \nabla \phi$ . [4]

(c) By using Laplace transform, solve : [4]

$$\frac{dy}{dt} + 2y + \int_0^t y(t)dt = \sin t$$

given that y(0) = 1.

5. (a) Evaluate using Green's theorem  $\int_C \overline{F} \cdot d\overline{r}$  where  $\overline{F} = x^2 \overline{i} + xy \overline{j}$ over a region R enclosed by  $y = x^2$  and line y = x. [4]

[5252]-585

(b) Evaluate  $\iint_{S} \overline{F} \cdot \hat{n} \, ds$  where  $\overline{F} = z\overline{i} + x\overline{j} - 3y^2 z\overline{k}$  and S is surface of cylinder  $x^2 + y^2 = 16$  included in first octant between z = 0 and z = 5. [4]

$$(c)$$
 Evaluate :

$$\iint_{\mathbf{S}} (\nabla \times \overline{\mathbf{F}}) \cdot d\overline{\mathbf{S}} \text{ where}$$
$$\overline{\mathbf{F}} = (x - y)\overline{i} + (x^2 + yz)\overline{j} + (-3xy^2)\overline{k}$$

and S is surface of cone  $z = 2 - \sqrt{x^2 + 4^2}$  above XoY plane. [5]

Or

**6.** (*a*) If :

$$\overline{\mathbf{F}} = (2xy + 3z^2)\overline{i} + (x^2 + 4yz)\overline{j} + (2y^2 + 6xz)\overline{k},$$

evaluate  $\int_{S} \overline{F} \cdot d \overline{r}$  where 'C' is curve x = t,  $y = t^{2}$ ,  $z = t^{3}$  joining points (0, 0, 0) and (1, 1, 1). [4]

(a) Evaluate :

$$\iint_{\mathbf{S}} [(x+y^2)\overline{i} - 2x\overline{j} + 2yz\,\overline{k}\,].\,d\overline{\mathbf{S}}$$

where S is surface of tetrahedron bounded by co-ordinate planes and plane 2x + y + 2z = 6. [4]

(c) Evaluate 
$$\iint_{S} (\nabla \times \overline{F}) d\overline{S}$$
 where :

$$\overline{F} = (2x - y)\overline{i} - yz^2\overline{j} - y^2z\overline{k}$$
 and S is

upper half of surface of sphere  $x^2 + y^2 + z^2 = 1$ . [5]

- 7. Solve any two :
  - (a) A string is stretched tightly between x = 0, x = l and both ends are given displacement  $y = a \sin pt$ perpendicular to the string. If the string satisfies the equation  $\frac{\partial^2 y}{\partial x^2} = \frac{1}{c^2} \frac{\partial^2 y}{\partial t^2}$ , prove that the oscillations of the string are given

by 
$$y = a \sec \frac{pl}{2c} \cos \left( \frac{px}{c} - \frac{pl}{2c} \right) \sin pt$$
. [7]

 (b) A homogeneous rod of conducting material of length 100 cm has its ends kept at zero temperature and the temperature initially is :

$$u(x,0) = \begin{cases} x, & 0 \le x \le 50, \\ 100 - x, 50 \le x \le 100 \end{cases}$$

Find the temperature u(x, t) at any time. [6] (c) Sovle : [6]

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

subject to the conditions :

(i) u(0, y) = 0(ii)  $u(\pi, y) = 0$ (iii)  $u(x, \infty) = 0$  for  $0 < x < \pi$ (iv)  $u(x, 0) = u_0$  for  $0 < x < \pi$ .

8. Solve any two :

(a) Solve 
$$\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$$
 if :  
(i)  $y(0, t) = 0$ 

(*ii*) 
$$y(l, t) = 0$$
  
(*iii*)  $\left(\frac{\partial y}{\partial t}\right)_{t=0} = 0$   
(*iv*)  $y(x, 0) = k(lx - x^2), 0 \le x \le l.$  [7]  
(*b*) Solve  $\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}$  if :  
(*i*)  $u(0, t) = 0$ 

(i) 
$$u(0, t) = 0$$
  
(ii)  $u_x(1, t) = 0$   
(iii)  $u(x, t)$  is bounded and  
(iv)  $u(x, 0) = 3x$ , for  $0 < x < 1$ . [6]

(c) Using Fourier sine trassform, solve the equation :

$$\frac{\partial u}{\partial t} = 2 \frac{\partial^2 u}{\partial x^2}, \ 0 < x < \infty, \ t > 0$$

subject to the conditions :

(i) 
$$u(0, t) = 0, t > 0$$
  
(ii)  $u(x, 0) = e^{-x}, x > 0$   
(iii)  $u \& \frac{\partial u}{\partial x} \to 0 \text{ as } x \to \infty$ . [6]

Total No. of Questions—8]

[Total No. of Printed Pages-3

Seat No.

# [5252]-586

### S.E. (Chem.) (Second Semester) EXAMINATION, 2017

#### CHEMISTRY-II

#### (2015 PATTERN)

#### Time : Two Hours

#### Maximum Marks : 50

- **N.B.** :— (i) Neat diagrams must be drawn wherever necessary.
  - (ii) Figures to the right indicate full marks.
  - (iii) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (iv) Assume suitable data if necessary.
- (a) Explain the primary, secondary and tertiary structures of proteins. [6]
  - (b) What is EAN rule ? Give two example in which this rule is not obeyed. [3]
  - (c) Discuss the splitting of *d*-orbitals in tetrahedral crystal field. [3]

#### Or

- **2.** (a) Explain the phenomenon of Mutarotation. [3]
  - (b) Write a note on the mechanism of enzyme action. [3]
  - (c) Explain the magnetic properties of complexes of transition metals by crystal field theory. [6]

- 3. (a) Explain the working of indicators in Fajan's method for halide quantity determination. [4]
  - (b) Calculate the weight of  $KMnO_4$  required to make 500 ml of 0.1 N  $KMnO_4$  solution, for titration in acidic medium. [3]
  - (c) What is an adsorption isotherm ? Explain the Langmuir isotherm. [6]

#### Or

- 4. (a) Explain the role of metal complex catalyst with the help of Wacker's process. [6]
  - (b) What is complexometric titration ? Give the theory involved in them. [4]
  - (c) 50 ml of a solution containing Ca<sup>++</sup> is titrated against
     0.035 M disodium EDTA from burette to get the end point
     20.4 ml, in the complexometric titration. Calculate the amount
     of Ca<sup>++</sup> ions per litre of the solution. [3]
- 5. (a) Explain the conformation of butane by Newman projection formula. [6]
  - (b) Draw the R and S configuration of : [3]
     (i) Lactic acid
    - (*ii*) Glyceraldehyde.
  - (c) Explain racemisation. [3]

#### Or

- 6. (a) Give optical isomerism of compound containing two or more similar chiral carbon atom by using suitable example. [6]
  - (b) Explain Baeyer's strain theory for cycloalkanes. [6]

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 $\mathbf{2}$ 

7.	<i>(a)</i>	Give the reaction involved in the synthesis of	the	
		following :	[6]	
		(i) Parathion		
		(ii) Carboryl.		
	( <i>b</i> )	) Explain the terms (any $two$ ) :		
		(i) Antibiotic		
		(ii) Antihistamine		
		( <i>iii</i> ) Diuretic.		
	( <i>c</i> )	Write a note on "Potassium fertilizer".	[3]	
		Or		
8.	( <i>a</i> )	Describe the synthesis and uses of the following :	[6]	
		(i) Aspirin		
		(ii) Paracetamol.		

(b) Give the types of pesticide formulations and their application.

[7]

Total No. of Questions—8]

Seat	
No.	

### [5252]-587

### S.E. (Chemical) (Second Semester) EXAMINATION, 2017 HEAT TRANSFER (2015 PATTERN)

### **Time : Two Hours**

#### Maximum Marks : 50

- **N.B.** :— (i) Neat diagrams must be drawn wherever necessary.
  - (ii) Figures to the right indicate full marks.
  - (iii) Assume suitable data, if necessary.
  - (iv) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 1. (a) Explain in detail modes of Heat Transfer with laws. [6]
  - (b) Water at 80°C is flowing at a velocity of 3 m/s through a tube of 16 mm diameter maintained at constant wall temperature of 297 K. If the exit temperature of water is 309 K, determine the rate of heat transfer per meter length of tube.

#### Data :

Properties of water at mean bulk temperature, Dynamic viscosity :  $485 \times 10^{-6} \text{ N.s/m}^2$ Density :  $984 \text{ kg/m}^3$ Thermal conductivity : 0.657 W/m.KSpecific heat : 4187 J/kg.K

- 2. (a) A furnace is constructed with 0.23 m thick of fire brick, 0.115 m of insulating brick and then 0.23 m of building brick. The inside temperature of the furnace is 1213K and the outside temperature is 318 K. The thermal conductivities of fire brick, insulating brick and building brick are 6.047, 0.581 and 2.33 W/(mK). Find the heat loss per unit area. [7]
  - (b) Write short notes on (any two): [5]
    - (i) Reynolds Analogy
    - (ii) Individual and overall heat transfer coefficient
    - (iii) Thermal Boundary Layer
- 3. (a) What is Radiation ? Explain black body. [3]
   Explain any two : [3]
  - (i) Specular and Diffuse Reflection
  - (*ii*) Emissivity
  - (*iii*) Radiation Shield.
  - (b) Describe pool boiling curve in detail with neat sketch. [7] Or
- 4. (a) Determine the net radiant interchange between two parallel oxidized iron plates, placed at a distance of 25 mm having sides 3\*3 m. The surfaces temperatures of two plates are 373 K and 313 K respectively. Emissivities of the plates are equal. Given  $e_1 = e_2 = 0.736$ . [4]

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 $\mathbf{2}$ 

- (b) Define monochromatic emissive power and monochromatic emissivity. [3]
- (c) Define Condensation ? Differentiate between filmwise and dropwise condensation with example. [6]
- 5. (a) What is heat exchanger ? Explain classification of Heat Exchanger ? [5]
  - (b) In an oil cooler, 60 g/s of hot oil enters a thin metal pipe of diameter 25 mm. An equal mass of cooling water flows through the annular space between the pipe and a large concentric pipe, the oil and water moving in opposite directions. The oil enters at 420 K and is to be cooled to 320 K. If water enters at 290 K, what length of pipe is required ? Take overall heat transfer coefficient U = 1108 W/(m<sup>2</sup>K). Specific heat of oil is 2.0 kJ/(kgK) and that of water is 4.18 kJ/(kgK). [6]
  - (c) Define Effectiveness of Heat Exchanger. [2]

Or

- 6. (a) Draw neat sketch of double pipe heat exchanger and explain. [5]
  - (b) A shell and tube heat exchanger is to be provided with tubes of 31 mm outer diameter and 27 mm inner diameter, 4 m long. It is required for heating water from 295 K to 318 K with the help of condensing steam at 393 K on the outside

of tubes. Determine the number of tubes required if water flow rate is 10 kg/sec. Heat transfer coefficient on steam side and water side are 6000 W/m<sup>2</sup>K and 850 W m<sup>2</sup>K respectively. Neglect all other resistances. [5]

(c) Define Capacity ratio and NTU [3]

7. (a) A single effect evaporator is used to concentrate 10,000 kg/hr of a solution at 298 K from 5% to 20% by weight of salt concentration. Steam is fed to the evaporator at pressure corresponding to the saturation temperature of 399 K. The evaporator is operating at atmospheric pressure and boiling point rise is 7 K. Calculate the heat load, the steam consumption and steam economy. [8]
Data : Specific heat of feed : 4.0 kJ/(kg.K)

Latent heat of condensation of steam at 399 K = 2185 kJ/kgLatent heat of vaporization of water at 373 K = 2257 kJ/kg.

(b) Define Capacity and Steam Economy of Evaporator. [4]

#### Or

8. (a) Give types of evaporators and write on Calendria type evaporator with a neat sketch. [6]

[5252]-587

4

(b) An aqueous sodium chloride solution (10 wt %) is fed into a single effect evaporator at a rate of 10000 kg/hr. It is concentrated to a 20 wt% sodium chloride solution. The rate of consumption of steam in the evaporator is 8000 kg/hr. Calculate capacity (kg/hr) and economy of the evaporator.

[6]

Total No. of Questions-4]

Seat	
No.	

# [5252]-588

# S.E. (Chemical Engineering) (Second Semester) EXAMINATION, 2017 PRINCIPLES OF DESIGN

#### (2015 **PATTERN**)

#### **Time : Two Hours**

#### Maximum Marks : 50

- N.B. := (i) Answer Q. 1 or 2, Q. 3 or 4, Q. 5 or 6, Q. 7 or 8.
  - (*ii*) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right side indicate full marks.
  - (iv) Use of Calculator is allowed.
  - (v) Assume suitable data if necessary.
- (a) A hollow shaft of 40 mm outer diameter and 25 mm inner diameter is subjected to a twisting moment of 120 N-m, simultaneously; it is subjected to an axial thrust of 10 kN and a bending moment of 80 N-m. Calculate the maximum compressive and shear stresses. [6]
  - (b) A hydraulic press exerts a total load of 3.5 MN. This load is carried by two steel rods, supporting the upper head of the press. If the safe stress is 85 MPa and E = 210 kN/mm<sup>2</sup>. Find : (1) diameter of the rods, and (2) extension in each rod in a length of 2.5 m.

(a) A beam is loaded and supported as shown in figure. Draw complete shear force and bending moment diagrams. [8]



- (b) Explain principal stresses and principal planes. [4]
- 3. Find the efficiency of the following riveted joints : [12]
  1. Single riveted lap joint of 6 mm plates with 20 mm diameter rivets having a pitch of 50 mm.
  - 2. Double riveted lap joint of 6 mm plates with 20 mm diameter rivets having a pitch of 65 mm.

Assume :

Permissible tensile stress in plate = 120 MPa Permissible shearing in rivets = 90 MPa Permissible crushing stress in rivets = 180 MPa

Or

4. Design a cast iron protective type flange coupling to transmit 15 kW at 900 r.p.m. from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used : [12] Shear stress for shaft, bolt and key material = 40 MPa Crushing stress for bolt and key = 80 MPa Shear stress for cast iron = 8 MPa

2

- 5. (a) Explain in detail the design procedure used for the design of pressure vessel subjected to external pressure. [5]
  - (b) A vessel is to be fabricated to withstand a pressure of 4kg/cm<sup>2</sup>, with welded joint efficiency of 85% M.S. Plates are available with 2.5 mm thickness. Find the maximum diameter of the vessel that can be fabricated with : [8]
    - (1) Torispherical (100-6) head
    - (2) Torispherical (80-10) head
    - (3) Elliptical (2:1) head
    - (4) Hemispherical head

The permissible stress for the given plates is 1200 kg/cm<sup>2</sup>. Or

6. (a) Calculate the thickness of a flanged torispherical head for a vessel having internal diameter 6000 mm. Design pressure of the vessel is 3.4 kg/cm<sup>2</sup>. Inside crown radius is 6000 mm. Inside knuckle radius is 380 mm. Permissible stress of the material is 1190 kg/cm<sup>2</sup>, welded joint efficiency is 100%.[6]

- (b) What is proportioning of vessels ? Why is it necessary ? [7]
- 7. (a) Explain Autofrettage construction for high pressure vessels. [4]
  - (b) A high pressure vessel fabricated by shrink fit construction has three concentric shells. The ration of outer radius to inner radius for all the shell is 1.4. The vessel is subjected to internal pressure of 150 kg/cm<sup>2</sup>. Pressure outside is atmospheric. Estimate :
    - (*i*) The maximum combined stress at the interface of concentric shells.

(*ii*) Interface pressure resulting from internal pressure and shrinkage stress.

Data-Modules of elasticity =  $2 \times 10^6$  kg/cm<sup>2</sup>, Internal dia. of vessel is 400 mm. [9]

Or

- 8. (a) A vessel is to be designed to withstand internal pressure of 150 MN/m<sup>2</sup>. An internal diameter of 300 mm is specified and a steel having a yield point of 450 MN/m<sup>2</sup> has been selected. Calculate the wall thickness required by various theories with a factor of safety 1.5. [6]
  - (b) Explain the difference between the design of a normal pressure vessel and high pressure vessel with relevant equations.

[7]

Total No. of Questions-8]

Seat	
No.	

# [5252]-589

### S.E. (Chemical Engineering) (Second Semester) EXAMINATION, 2017 CHEMICAL ENGINEERING THERMODYNAMICS-I (2015 PATTERN)

#### **Time : Two Hours**

### Maximum Marks : 50

- **N.B.** :- (i) Answer Q. 1 or 2, Q. 3 or 4, Q. 5 or 6, Q. 7 or 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (*iii*) Figures to the right side indicate full marks.
  - (*iv*) Use of calculator is allowed.
  - (v) Assume suitable data if necessary.
- 1. (a) A steel casting weighing 2 kg of water has initial temperature of 773K and 40 kg of water initially at 298 K is contained in a perfectly insulated steel tank weighing 5 kg. The casting is immersed in the water and the system is allowed to come to equilibrium. What is its final temperature ? Ignore any effect of expansion or contraction and assume constant specific heats of 4.18 kJ/kg. K for water and 0.5 kJ/kg.K for steel. [8]
  - (b) Write a note on heat of formation and its utility. [4] Or
- 2. (a) One kilogram of air is heated reversibly at constant pressure from an initial state of 300K and 1 bar until its volume triples. Calculate W, Q,  $\Delta U$  and  $\Delta H$  for the process. Assume that air obeys the relation : [8]

PV/T = 83.14 (bar.cm/T mol.K),  $C_p = 29$  J/mol.K P.T.O.
(b) Explain P-T diagram for a pure substance.

[4]

3. Calculate the heat of the following gas phase reaction : [12]  $H_2 + 1/2 \quad O_2 \rightarrow H_2 O$   $\Delta H^o_{298} = -242 kJ$ If the reactants are at 473 K and the product is at 993K, the specific heats  $C_p = \alpha + \beta T + \gamma T^2$  (J/mol.K) may be evaluated using the data given below:

	α	β	γ
$H_2$	29.09	$-8.374$ $^{*}10^{-4}$	$-2.0139  {}^{*}\!10^{-6}$
	25.74	$12.987^*\!10^{-\!3}$	$-3.864^*10^{-6}$
H <sub>2</sub> O	30.38	$9.629^*10^{-3}$	$-1.185^{*}10^{-6}$

## Or

4. (a) Explain limitations of first law of thermodynamics. [3]

- (b) An ideal gas is undergoing a series of three operations. The gas is heated at constant volume from 300K and 1 bar to a pressure of 2 bar. It is expanded in a reversible adiabatic process to a pressure of 1 bar. It is cooled at constant pressure of 1 bar to 300K. determine the heat and work effects for each step. Assume  $C_p = 29.3 \text{ kJ/kmol.K}$  [9]
- 5. (a) Explain residual properties. Derive the following fundamental residual property relation for 1 mol of substance for closed thermodynamic system : [8]

 $d(G^{R}/RT) = V^{R} dP/(RT) - H^{R}dT/(RT^{2})$ 

(b) Derive the Clausius-Clapeyron equation for vapor-liquid two phase system. [5]

[5252]-589

### Or

- 6. (a) Show that :  $C_p C_v = TV\beta^2/K$ 
  - (b) Define isothermal compressibility and adiabatic compressibility.[5]

[8]

- 7. (a) A vapour compression refrigeration system with ammonia as the working fluid is to operate between 266K and 300K.
   Determine : [8]
  - (i) COP, given that the enthalpy of saturated vapour at 266K
     = 656 kJ/kg and enthalpy of superheated vapour leaving the compressor = 724 kJ/kg, enthalpy of saturated liquid at 300K = 144 kJ/kg.
  - (ii) COP, if a temperature approach of 5 K is necessary in the evaporator and condenser and the efficiency of the compressor is 75%. Enthalpy of saturated vapour entering the condenser = 758 kJ/kg, enthalpy of saturated liquid at 305K = 159 kJ/kg.
  - (b) Give the desired properties of refrigerants. [5]

Or

- 8. (a) A vapour compression cycle using ammonia as refrigerant is employed in an ice manufacturing plant. Cooling water at 288K enters the condenser at a rate of 0.25 kg/sec and leaves at 300K. Ammonia at 294 K condenses at rate of 0.50 kg/minute. Enthalpy of liquid ammonia at 294 K is 281.5 kJ/kg. The compressor efficiency is 90%. Saturated ammonia vapour at 258K and the enthalpy of 1426 kJ/kg enters the compressor. What is the power requirement of the compressor and refrigeration capacity in tons ? [9]
  - (b) Write a note on refrigerator capacity. [4]

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# S.E. (Chemical Engineering) (Second Semester) EXAMINATION, 2017 MECHANICAL OPERATIONS (2015 COURSE)

#### Time : Two Hours Maximum Marks : 50 Attempt Question nos. 1 or 2, 3 or 4, 5 or 6, 7 **N.B.** :— (*i*) or 8. Figures to the right indicate full marks. (ii)Neat diagrams must be drawn wherever necessary. (iii)(iv)Assume suitable data, if necessary. (v)Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted. 1. (a)(i)Explain capacity and effectiveness of screen. [4] What is work index ? [2](ii)(b)Derive the equation to find area of thickener. [7]Or2. (a)Explain Open and Close Circuit grinding with its flow sheet. Which is More effective ? Why ? [8] Write note on free settling and hindered settling. (b)[5]3. Explain Forth Floatation with neat sketch. [6] (a)(b)Describe Sigma mixer and Tumbling mixer. [6]

P.T.O.

Or

4.	(a)	Explain	Mineral	Jig	with	neat	sketch.		[4]
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- (b) (i) State two methods for prevention of vortex formation?
  [2]
  - (ii) A soil containing 14% moisture was mixed in large Muller mixer with 10 weight percent of a tracer consisting of dextrose and picric acid. After 3 min. of mixing, 12 random samples were taken from the mix. and analysed for tracer material. The measured concentration in the sample were, in weight percent tracer, 10.24, 9.30, 7.94, 10.24, 11.08, 10.03, 11.91, 9.72, 9.20, 10.76, 10.97, 10.55. Calculate the mixing index. [6]
- 5. (a) Explain with neat diagram Batch and continuous Centrifugal filters. [8]
  - (b) Deflue Filter aids. Give name of filter aid and state method of using filter aid.[5]

### Or

- 6. (a) Describe with neat sketch the working of plate and frame filter press. Also write two advantages of plate and frame filter press
   [8]
  - (b) A rotary drum filter, operating at 0.02 Hz, filters 0.0075 m<sup>3</sup>/sec? Operating under the same vacuum and neglecting the resistance of the filter cloth, at what speed must be filter be operated to give a filtration of 0.0150 m<sup>3</sup>/sec? [5]

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- 7. (a) Explain Belt Conveyor with neat diagram. [5]
  - (b) Explain closed loop pneumatic conveying system with its flow sheet. [7]

# Or

- 8. (a) Write advantages and disadvantages of Screw Conveyors. [4]
  - (b) Write short note on Bucket elevator and Chain and flight conveyor. [8]