Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-1

S.E. (Mechanical/Auto.) 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 books.

(*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 logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

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

Section–I

1. (*a*) Sketch a Merchant's circle force diagram and explain the different quantities involved. State the various assumptions made. [10]

(*b*) With neat sketch explain the tool signature in ORS system. [8]

Or

2. (*a*) How is the tool shank of a single point cutting tool designed ?[6]

(*b*) What is meant by built-up edge (BUE) ? With a neat sketch explain the formation of a (BUE). [6]

P.T.O.

(*c*) How do you define tool life ? Explain the parameters that control the tool life of a single point cutting tool. [6]

3. (*a*) Explain the principle of Gear Shaping and Gear Shaving. [8]

(*b*) Describe with neat sketch the detail terminology of pull type internal broach. [8]

Or

4. (*a*) What is thread rolling ? Explain its advantages. [8]

(*b*) Explain the principle of Gear hobbing. List advantages and disadvantages of gear hobbing. [8]

5. (*a*) Write short notes on the following : [8]

(*i*) FMS (Flexible Manufacturing System)

(*ii*) CNC Machine.

(*b*) Explain principle and block diagram of machining centers. State its advantages and disadvantages.

Or

6. (*a*) Draw block diagram of NC and DNC machine system. Compare NC and DNC system. [8]

(*b*) Explain the following M-codes and G-codes : [8]

(*i*) G90

(*ii*) G02

(*iii*) G63

(*iv*) G41

(*v*) M05

(*vi*) M06

(*vii*) M11

(*viii*) M30

Section–II

7. (*a*) What factors should be considered for selecting an appropriate press for a given job ? [8]

(*b*) Define spring back and explain how allowances may be made to compensate for its harmful effects. [8]

Or

8. (*a*) Differentiate between blanking die and piercing die. [8]

(*b*) Sketch the various methods of applying shear to the punch and die. [8]

9. (*a*) Explain why unconventional machining processes are used.[4]

(*b*) Briefly explain the working of ECM showing important elements. [6]

(*c*) Explain the disadvantages of the relaxation circuit and show the alternative arrangement of pulse generator used in EDM. [8]

Or

10. (*a*) What is LASER ? Explain how LASER is used to machine the parts and state its process characteristics. [10]

(*b*) Draw and explain schematic diagram of Water Jet Machining. State its advantages, disadvantages and applications. [8]

11. (*a*) Describe the degrees of freedom of a work piece located in space. [8]

(*b*) Define Jig and Fixture. Differentiate between them with suitable example. [8]

Or

12. (*a*) Explain the advantages to be obtained from the use of pneumatic and hydraulic clamping devices. [8]

(*b*) Explain different types of drill bushes with neat sketches.[8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**6**

Seat No.	

[5152]-2

S.E. (Mechanical S/W) (Second Semester)

EXAMINATION, 2017

COMPUTER APPLICATIONS

(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*) Figures to the right indicate full marks.

(*iv*) Use of calculator is allowed.

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

SECTION I

1. (*a*) Find root of

$$x^3 - 5x^2 + 7x - 3 = 0$$

correct to four decimal places using Modified Newton-Raphson method consider starting point as $x = 0$. [8]

(*b*) List different Numerical Methods for Integration with advantages and disadvantages. [8]

P.T.O.

Or

2. (*a*) Evaluate :

$$\int_{0.2}^{1.5} \left(e^{-x^2}\right)$$

using Gauss Quadrature 2 point formula. [8]

(*b*) Explain Modified Newton Rahpson method graphically and list its disadvantages. [8]

3. (*a*) Find the value of y at $x = 34$ using Newton's Backward difference interpolation. [8]

x	***y***
20	11.4699
25	12.7834
30	13.7648
35	14.4982

(*b*) List different Numerical Methods for differentiation with advantages and disadvantages. [8]

Or

4. (*a*) Find the value of y at $x = 45$ using Newton's Forward difference interpolation. [8]

x	***y***
40	31
50	73
60	124
70	159

(*b*) Explain the selection criteria for Numerical Interpolation methods. [8]

5. (*a*) Solve the following set of simultaneous equations using Gauss-Siedel method. Do six Iterations : [10]

$$10x + 2y + z = 9$$

$$2x + 20y - 2z = -44$$

$$-2x + 3y + 10z = 22$$

(*b*) Explain with flow chart Gauss Elimination method. [8]

Or

6. (*a*) Solve the following set of simultaneous equations using Gauss Elimination method : [10]

$$2x + 4y + z = 3$$

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

$$x - y + z = 6$$

(*b*) Explain with flow chart Gauss-Siedel Method. [8]

SECTION II

7. (*a*) Draw flow chart for fitting Quadratic equation. [8]

(*b*) Pressure and Volume of a gas are related by the equation $PV^a = b$, where '*a*' and '*b*' are constants. Fit this equation

to the following set of data : [8]

P	V
0.5	1.62
1.0	1.0
1.5	0.75
2.0	0.62
2.5	0.52

Or

8. (*a*) Explain the following with suitable example : [8]

(*i*) Error propagation

(*ii*) Absolute Error

(*iii*) Relative Error.

(*b*) Fit a straight line through the following set of points : [8]

x	y
178	3
120	7
72	9
63	10

9. (*a*) Draw flow chart to solve ordinary differential equation using Euler's method. [8]

(*b*) Solve the equation :

$$\frac{dy}{dx} = -2xy^2,$$

find $y(0.4)$ taking step size of 0.1 using Runge-Kutta 2nd order method. Given the initial condition as $y(0) = 1$. [8]

Or

10. (*a*) Draw flow chart to solve ordinary differential equations using RK-4 method. [8]

(*b*) Given [8]

$$\frac{dy}{dx} = x - y^2,$$

find y at $x = 0.8$ and 1.0 using Milne's method. Given :

x	y
0	0
0.2	0.02
0.4	0.0795
0.6	0.1762

11. (*a*) Draw flowchart to solve elliptic equation. [8]

(*b*) Evaluate the pivotal values of equation [10]

$$u_{tt} = 16u_{xx},$$

taking $\Delta x = 1$ upto $t = 3$. The boundary conditions are

$u(0, t) = u(5, t) = 0$ and $u(x, 0) = x^2(5 + x)$

List values for 3 iterations.

Or

12. (*a*) Draw flowchart to solve Hyperbolic equation. [8]

(*b*) Solve the Parabolic equation : [10]

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

subject to condition

$$u(x, 0) = \sin \pi x, \quad 0 \leq x \leq 1,$$

$$u(0, t) = u(1, t) = 0$$

using Crank-Nicolson method, do two iterations taking

$$h = \frac{1}{3}, \quad k = \frac{1}{36}.$$

Total No. of Questions—**12**] [Total No. of Printed Pages—**10**

Seat No.	

[5152]-3

S.E. (Electronics/E&TC) (I Sem.) EXAMINATION, 2017

NETWORK ANALYSIS

(2012 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*) Figures to the right indicate full marks.

(*iv*) Your answers will be valued as a whole.

(*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

1. (*a*) For the circuit shown in Fig 1, find the branch currents I_1, I_2 & I_3 and node voltages V_1 & V_2 : [6]

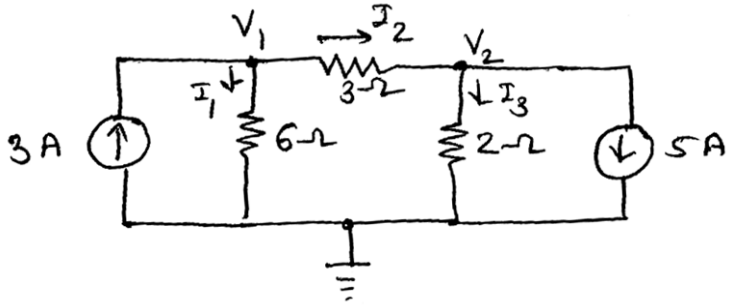


Fig. 1

P.T.O.

(*b*) Using the superposition theorem find the current I in the circuit shown in Fig. 2. [8]

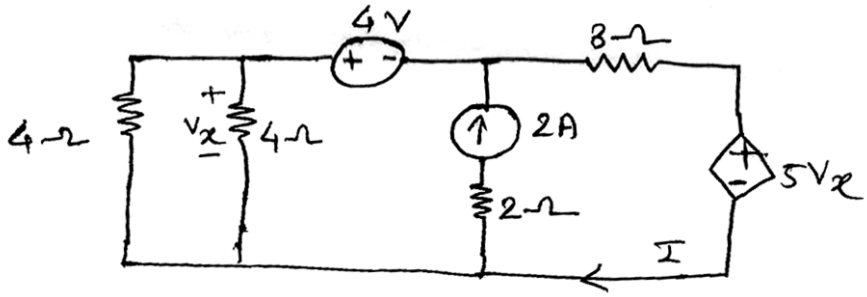


Fig. 2

(*c*) State & explain Thevenin's theorem. [4]

Or

2. (*a*) Using Kirchhoff's law, determine current i_1 in the circuit shown in Fig. 3. [6]

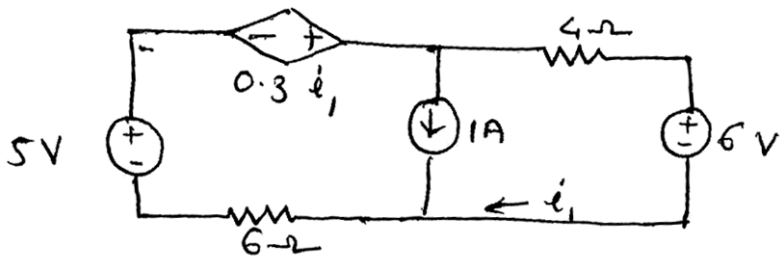


Fig. 3

(*b*) State & prove maximum power transfer theorem as applied to A.C circuits. [6]

(*c*) In the circuit shown in Fig. 4 use loop analysis to find the power delivered to 4 Ω resistor. [6]

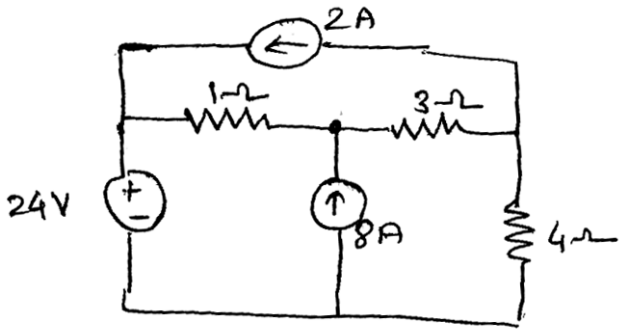


Fig. 4

3. (*a*) For a series RLC circuit : [6]

(*i*) Find the resonant frequency

(*ii*) Quality factor at resonance

(*iii*) Two half power frequencies

(*iv*) Bandwidth

Assume circuit consists of R = 100 Ω, L = 100 mH & C = 10 nf. The applied voltage across the circuit is 100V (rms).

(*b*) Prove that for a series resonant circuit, the resonant frequency is the geometric mean of two half power frequencies. [4]

(*c*) Find the bandwidth of the antiresonant circuit with the following conditions : [6]

(*i*) Q of the circuit inductive branch is 100

(*ii*) Frequency of unity power factor is 1 MHz

(*iii*) Value of Inductance = 100 μH

(*iv*) Internal resistance of genertor is 10 kΩ.

Or

4. (*a*) A resistor & a capacitor are in series with a variable inductor when this circuit is cinnected to 230 V, 50 Hz supply. The maximum current obtained by varying the inductor is 0.366 A. The voltage across the capacitor at that instant is 300 V. Find the circuit components. [6]

(*b*) Find the value of L for which the circuit shown in Fig. 5 is resonant at a frequency of ω_0 = 1000 rad/sec. [6]

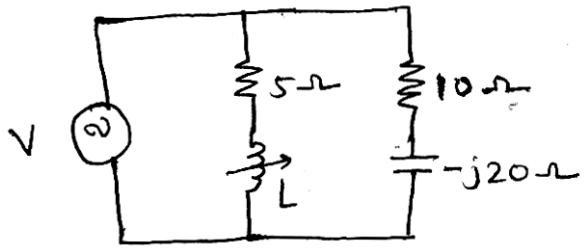


Fig. 5

(*c*) Draw any reactance curve characteristics for series resonant circuit. [4]

5. (*a*) Design a constant K low pass filter to be terminated in 600 Ω having cut-off frequency of 3 kHz. Determine :

(*i*) The frequency at which the filter attenuation is 17.372 db

(*ii*) Attenuation at 6 kHz

(*iii*) The characteristic impedance & phase constant at 2 kHz. [8]

(*b*) Find an iterative impedance for L section whose series arm impedance is 200 Ω & shunt arm impedance is 400 Ω Reter Fig. 6. [4]

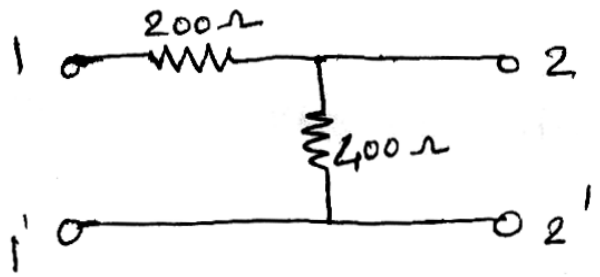


Fig. 6

(*c*) Draw reactance curve for constant KHPf & derive expression for cut-off frequency. [4]

Or

6. (*a*) An attenuator is composed of symmetrical T-section having series arm of 175 Ω each & shunt arm of 350 Ω. Find the characteristic impedance & attenuation (in dB). [4]

(*b*) Calculate the characteristic impedance, an attenuation constant & phase constant of a symmetrical 'T' network if : [6]

$Z_{OC} = 40 \angle 0° \ \Omega$ and $Z_{SC} = 20.3 \angle 29.8° \ \Omega$.

(*c*) Design a constant KLPf with $F_C = 1$ kHz & $R_c = 600 \ \Omega$ at what frequency α will be 10 dB ? [6]

SECTION II

7. (*a*) For the circuit shown in Fig. 7 below, determine the current in inductor L_2, after the switch is closed at $t = 0$ using Laplace transform. [8]

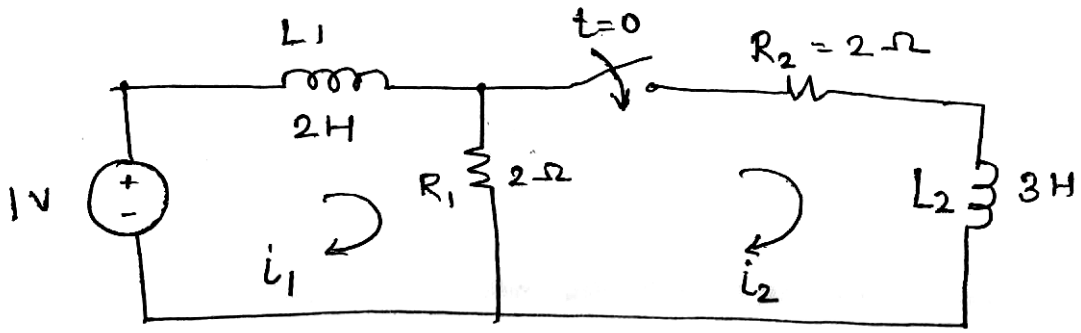


Fig. 7

(*b*) State whether the following function is suitable for driving point function analysis. [4]

$$Z(s) = \frac{5\left(3s^3 + 4s^2 + s + 4\right)}{s^5 + 3s^4 + 2s^3 + s^2}.$$

(*c*) What is network function ? Give various types of network functions for one and two port networks. [4]

Or

8. (*a*) Considering different examples explain how time behaviour can be interpreted from pole zero plot. [6]

(*b*) In the circuit of Fig. 8, find $V_a(t)$ using Laplace transform. Assume $i_L(0\_) = 2A$. [6]

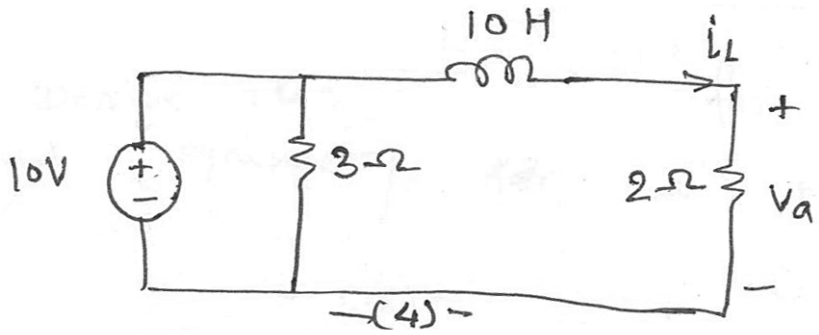


Fig. 8

(*c*) Find the driving point impedance of the given network in Fig. 9 below : [4]

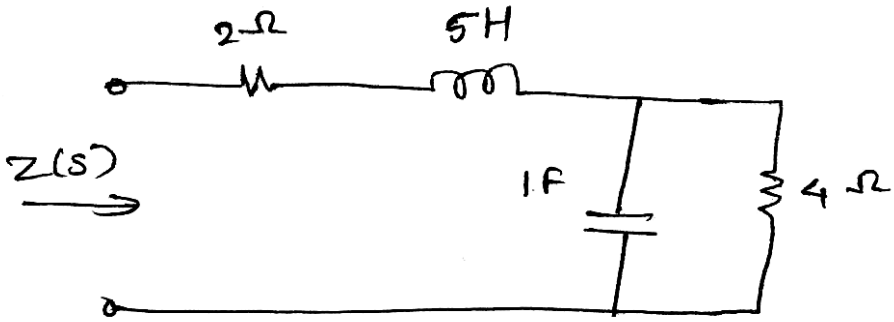


Fig. 9

9. (*a*) Find the 'Z' parameters of the network shown in Fig. 10. [6]

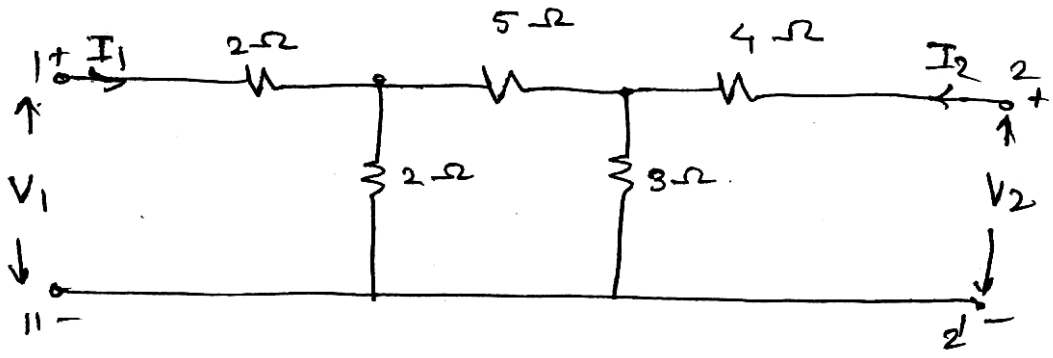


Fig. 10

(*b*) Find out transmission parameters for the network shown in Fig. 11. [6]

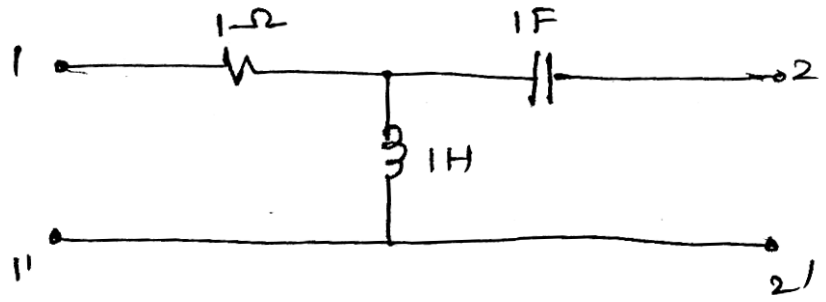


Fig. 11

(*c*) Determine hybrid parameters in terms of admittance parameters. [4]

Or

10. (*a*) Derive the condition for reciprocity and symmetry for 'Z' parameters. [4]

(*b*) Determine 'y' parameters for the network shown in Fig. 12. [6]

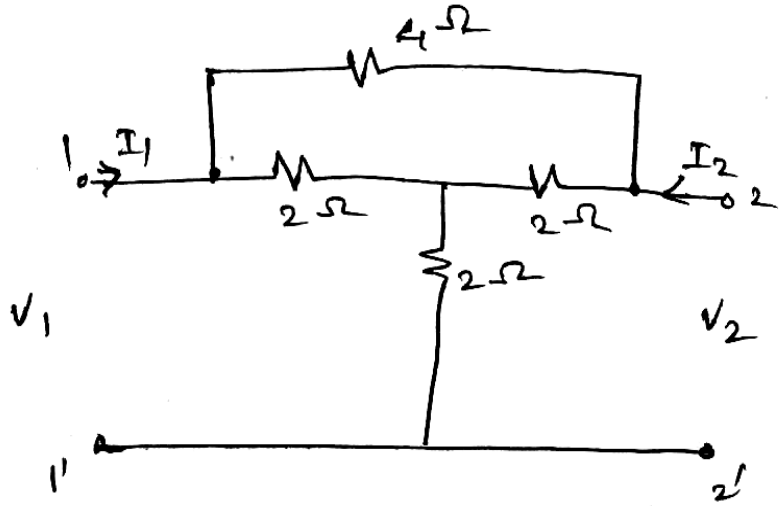


Fig. 12

(*c*) Obtain 'Z' parameters for the circuit shown in Fig. 13 below. [6]

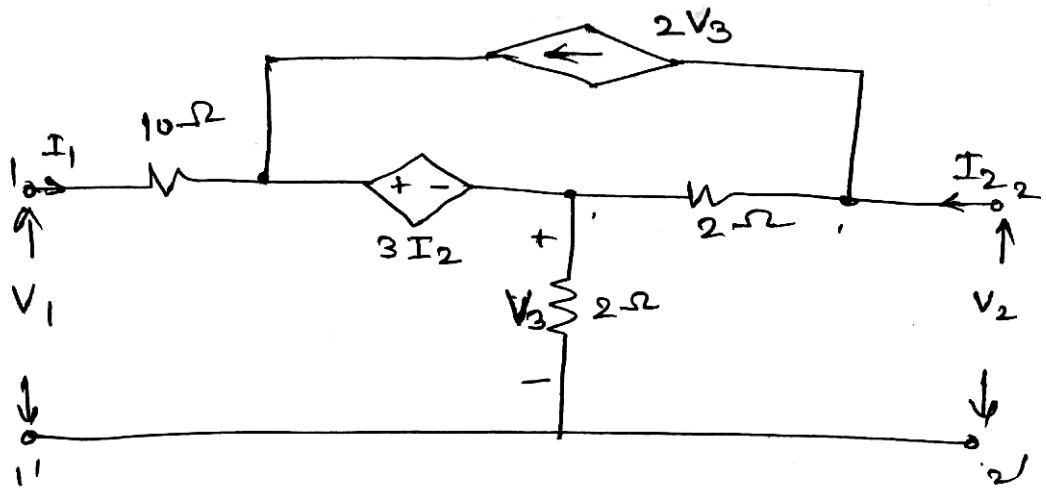


Fig. 13

11. (*a*) Derive the relationship of Z_0 and Y in terms of primary constants of transmission line. [8]

(*b*) A genertor of 1 V, 1 kHz supplies power to 100 km long line terminated in Z_0 and having the following constants :

R = 10.4 Ω/km,

L = 0.00367 H/km

G = 0.8×10^{-6} ℧/km,

C = 0.00835×10^{-6} F/km

Calculate Z_0, attenuation constant, phase shift constant, wavelength, velocity, receiving current and voltage. [10]

Or

12. (*a*) Define standing wave ratio and reflection coefficient (*k*). Also derive the relation between SWR and reflection coefficient (*k*). [6]

(*b*) A transmission line has characteristic impedance of 50 Ω and is terminated in load impedance of (75 + *j*40)Ω. Calculate standing wave ratio and reflection coefficient (*k*). [4]

(*c*) A transmission line 10 km long is terminated properly at the far end at a frequency of 1000 Hz. The attenuation and phase shift constants of the line are 0.03 nepers/km and 0.03 radians/km respectively. If the far end voltage is 1000 Hz, 4 $\angle$ 0° volts. Calculate sending end voltage of the line. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**5**

Seat No.	

[5152]-4

S.E. (E&TC/Electronics) EXAMINATION, 2017

POWER DEVICES AND MACHINES

(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 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.

SECTION I

1. (*a*) Draw and explain structure of power diode. [4]

(*b*) Draw and explain reverse recovery characteristics of soft recovery diode. [3]

(*c*) Explain safe operating area of a power transistor. [5]

(*d*) Explain with neat diagram switching characteristics of Power BJT. [6]

P.T.O.

Or

2. (*a*) Explain operational principle of IGBT. [4]

(*b*) Explain Latch-up in IGBT. [4]

(*c*) Explain N-channel VDMOS power MOSFET. [6]

(*d*) Discuss methods of isolation between driver and power control circuit. [4]

3. (*a*) Discuss the following related with SCR : [6]

(*i*) Average Current Rating

(*ii*) Surge Current Rating

(*iii*) Forward *di/dt* Rating.

(*b*) Explain GTO turn-off circuit with neat sketch and waveform. [6]

(*c*) Explain with neat sketch turn On process of TRIAC in mode 1 and mode 2. [4]

Or

4. (*a*) With neat diagram, explain dynamic characteristics of SCR ? Also define Delay time, Rise time and Spread time. [8]

(*b*) Draw and explain trigger circuit for TRIAC using DIAC. [5]

(*c*) Compare TRIAC and SCR. [3]

5. (*a*) Name the various commutation methods of SCR and explain any *two*. [8]

(*b*) Draw and explain single-phase full converter using Bridge rectifier with resistive load. [8]

Or

6. (*a*) Draw and explain three-phase full wave AC voltage controller with resistive load. [8]

(*b*) A single-phase half wave controlled rectifier operated with 230 V, 50 Hz signal, with resistive load of 8 Ω. If the average O/P voltage is 25% of the maximum possible average output voltage, find out firing angle. [3]

(*c*) Define the following performance parameters for rectifiers : [5]

(*i*) Rectifier efficiency

(*ii*) Form Factor

(*iii*) Ripple Factor

(*iv*) Output AC Power

(*v*) Efficiency of rectifier.

SECTION II

7. (*a*) Classify the choppers. Explain second quadrant and two quadrant type B chopper. [9]

(*b*) Draw and explain single-phase modified McMurray-Bedford half bridge inverter. [9]

Or

8. (*a*) Explain operating principle of line Interactive UPS. [4]

(*b*) Write a short note on Boost Regulator. [7]

(*c*) A 3ϕ bridge inverter with 600 DC voltage, operated in 180° conduction mode with resistive star connected load with R = 15 Ω per phase, calculate : [7]

(*i*) rms value of load current

(*ii*) rms value of switch current

(*iii*) power delivered to the load.

9. (*a*) Explain the operating principles of DC Motor. [6]

(*b*) For the DC motor, prove that : [6]

$$T_a = \frac{1}{2\pi}\phi\ z \times I_a\left(\frac{P}{A}\right) \text{N-m.}$$

(*c*) Explain speed-torque characteristics of universal motor. [4]

Or

10. (*a*) Explain necessity of starters for 3ϕ induction motors. [4]

(*b*) Explain speed control of DC shunt motor using field current control method. [6]

(*c*) Write a short note on Armature winding. [6]

11. (*a*) Explain current transformer for measuring large alternating currents. [6]

(*b*) Explain working principles of AC servo motors. [5]

(*c*) Draw and explain characteristics of BLDC motors. [5]

Or

12. (*a*) Draw and explain construction and working of permanent magnet stepper motor. [6]

(*b*) Write a short note on 4-point starter. [5]

(*c*) Define the following stepper motor parameters : [5]

(*i*) Step Angle

(*ii*) Resolution

(*iii*) Speed

(*iv*) Slewing Rate

(*v*) Limiting Torque

(*vi*) Critical Torque.

Total No. of Questions—**6**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-5

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

ELECTROMAGNETICS

(2008 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.**

(*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.

1. (*a*) Find Electric field intensity E at (0, 0, 5) m due to $Q_1 = 0.35\ \mu C$ at (0, 4, 0) m and $Q_2 = -0.55\ \mu C$ at (3, 0, 0) m. [8]

(*b*) Define an Electric Dipole. Derive the expression for potential at a point P in free space due to dipole located on *z*-axis. [8]

Or

2. (*a*) State and prove Divergence theorem. [8]

P.T.O.

(*b*) Find the voltage across each dielectric in the capacitor shown in fig. 1, when applied voltage is 200 V. [8]

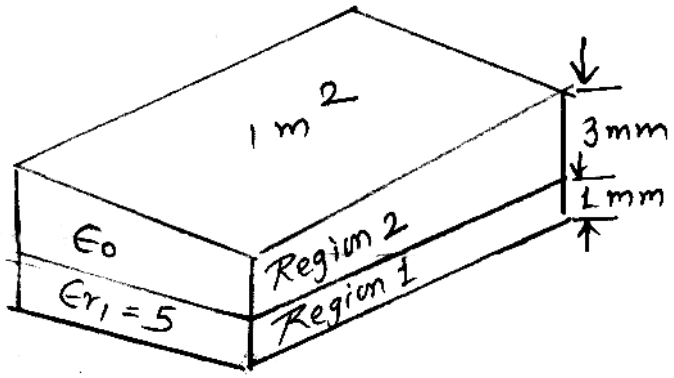


Fig. 1

3. (*a*) State and prove Ampere circuital law. Also explain the applications in detail. [8]

(*b*) Let $\overline{E} = 18\ \hat{a}_x - 11\,\hat{a}_y + 8.5\,\hat{a}_z$ V/m at a conductor free space boundary. Find the magnitude of : [8]

(*i*) $\overline{E}$

(*ii*) $\overline{E}_N$

(*iii*) E_T

(*iv*) ρ_s.

Or

4. (*a*) Obtain expression for $\overline{H}$ at the center of circular conductor carrying current I using Biot-Savart law. [8]

(*b*) Let $\mu = \mu_1 = 4\,\mu H/m$ in region 1 where $z > 0$, while $\mu_2 = 7\ \mu H/m$ in region 2, where $z < 0$ Moreover, let $\overline{K} = 80\,\hat{a}_x$ A/m on the surface $z = 0$. If there is a field $\overline{B}_1 = 2\hat{a}_x - 3\hat{a}_y + \hat{a}_z$ mT in region 1, find the value of $\overline{B}_2$. [8]

5. (*a*) A plane electromagnetic wave travelling in positive *z*-direction in an unbounded lossless dielectric medium with $\mu_r = 1$ and $\varepsilon_r = 3$ has a peak electric field intensity $\overline{E}$ of 16 V/m. Find : [10]

(*i*) Velocity of the wave

(*ii*) Intrinsic Impedance

(*iii*) Magnetic Field Intensity

(*iv*) Poynting Vector

(*b*) Write a short note on Method of Moments. [8]

Or

6. (*a*) Derive the expression for Poynting's Vector. Interpret each term. [10]

(*b*) Explain Finite Element method in detail. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[5152]-6

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

ELECTROMAGNETICS

(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*) Figures to the right indicate full marks.

(*iv*) Your answers will be valued as a whole.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

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

Section A

1. (*a*) What are charge distributions ? Derive an expression of electric field intensity due to surface charge. [9]

(*b*) Three parallel line charges ρ_{L_1} = 5 nC/m, ρ_{L_2} = 4 nC/m and ρ_{L_3} = –5 nC/m are located at (0, 0) (3, 0) and (0, 4) m respectively. Find $\bar{D}$ & $\bar{E}$ at (3, 4). [9]

Or

2. (*a*) State Gauss's Law and derive Maxwell's first equation from the same. [9]

P.T.O.

(*b*) Inside a cylindrical shell $3 < r < 4$ m, the electric flux density is given as $\bar{D} = 5(r - 3)^3 \hat{a}_r$ C/m^2.

(*i*) Find ρ_u at $r = 4$ m

(*ii*) Find $\bar{D}$ at $r = 4$ m

(*iii*) How much electric flux leaves the closed surface $3 < r < 4$, $0 < \phi < 2\pi$ and $-2.5 < z < 2.5$ [9]

3. (*a*) State and prove the relationship between Electric field intensity $\bar{E}$ and electric potential (V). [8]

(*b*) The current density in spherical co-ordinate system is given by

$$\bar{J} = \frac{100 \cos\theta}{r^2 + 1} \hat{a}_r \text{ A/m}^2$$

Find :

(*i*) How much current flows through spherical cap. $r = 3$ m, $0 < \theta < \frac{\pi}{6}$, $0 < \phi < 2\pi$.

(*ii*) If the same current as found above, flows through spherical cap. $r = 10$ m, $0 < \theta < \alpha$, $0 < \phi < 2\pi$, what should be value of 'α' ? [8]

Or

4. (*a*) Derive the expression for the electric field intensity at a point '*p*' in space, due to an electric dipole. [8]

(*b*) Point charges $Q_1 = 1\,nC$, $Q_2 = -2\,nC$, $Q_3 = 3\,nC$ and $Q_4 = -4\,nC$ are positioned one at a time and in that order at (0, 0, 0), (1, 0, 0), (0, 0, –1) and (0, 0, 1) respectively. Calculate the energy in the system after each charger is positioned. [8]

5. (*a*) Derive an expression for $\bar{H}$ for a finite line current using Ampere's current law. [8]

(*b*) An infinite long filament is placed along z axis. The magnetic field intensity at point *p*(3, 4, 0) is $10(-0.8\hat{a}_x + 0.6\,\hat{a}_y)$ A/m. Find the current through filament. [8]

Or

6. (*a*) State and explain Stokes' theorem. Also explain physical significance of curl. [8]

(*b*) In a certain conducting region

$$\bar{H} = yz(x^2 + y^2)\,\hat{a}_x - y^2xz\,\hat{a}_y + 4x^2y^2\,\hat{a}_z \text{ A/m.}$$

(*i*) Determine $\bar{J}$ at (5, 2, –3)

(*ii*) Show that $\nabla . \bar{B} = 0$. [8]

Section B

7. (*a*) Derive the boundary condition for electric field at an interface between dielectric-dielectric material. [9]

(*b*) Two extensive homogenous isotropic dielectrics meet on plane $z = 0$, for $z > 0$, $\varepsilon_{r_1} = 4$ and for $z < 0$, $\in_{r_2} = 3$. A uniform electric field $\bar{E}_1 = 5\hat{a}_x - 2\hat{a}_y + 3\hat{a}_z$ kV/m, exists for $z \geq 0$. Find :

(*i*) $\bar{E}_2$ for $Z \leq 0$

(*ii*) The angles E_1 and E_2 make with the interface.

(*iii*) The energy densities in J/m^3 in both dielectrics.

(*iv*) The energy within a cube of side 2 m centered at (3, 4, –5). [9]

Or

8. (*a*) Define the magnetic boundary conditions at the condition that $\bar{H}$ or $\bar{B}$ field must satisfy at the boundary between two different media. [9]

(*b*) Let $\mu_1 = 4\mu_0$ H/m in the region 1 where $z > 0$ while $\mu_2 = 7\mu_0$ H/m. wherever $z < 0$. In region 1 the magnetic field density $\bar{B}_1 = 2\hat{a}_x - 3\hat{a}_y + 2\hat{a}_z$ (mT), $\bar{K} = 60\hat{a}_x$ A/m on the surface $z = 0$. Find the value of $\bar{H}_{t_2}$ in region 2. [9]

9. (*a*) What is the significance of :

(*i*) Faraday's law

(*ii*) Displacement current. [8]

(*b*) An area of 0.65 m^2 in the $z = 0$ plane encloses a filamentary conductor. Find the induced voltage if

$$\bar{B} = 0.05 \cos 10^3 t \left(\frac{\hat{a}_y + \hat{a}_z}{\sqrt{2}} \right) (T).$$ [8]

Or

10. (*a*) Derive Helmholtz's wave equations for lossy dielectric. [8]

(*b*) Calculate the average power crossing the circular area of radius 2.5 m in free space with z constant, where

$$\bar{E}(z, t) = 50 \cos(\omega t - \beta z)\hat{a}_x \text{ V/m}$$ in free space. [8]

11. (*a*) Explain the steps involved for graphical representations of electric field lines and equipotential lines. [8]

(*b*) Derive the expression for e.m.f. induced in conductor in motion through the time varying field. [8]

12. Write short notes on (any *two*) : [16]

(*i*) Finite element method

(*ii*) Method of moments

(*iii*) Method of Images.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-7

S.E. (Electrical) (II Sem.) EXAMINATION, 2017

MICROPROCESSOR FUNDAMENTALS AND ITS APPLICATIONS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

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

(*ii*) Answer *three* questions from Section I and *three* questions from Section II.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Your answers will be valued as a whole.

SECTION I

1. (*a*) Draw the 8 bit structure of the flag register of 8085 and explain. [8]

(*b*) Draw the pin diagram and explain the features of 8085 microprocessor. [8]

Or

2. (*a*) Explain the functions of the following registers : [8]

(*i*) Instruction register

(*ii*) Program counter.

P.T.O.

(*b*) Explain the following instruction of 8085 microprocessor : [8]

(*i*) LDA 3000

(*ii*) LHLD 3000

(*iii*) SIM

(*iv*) RIM.

3. (*a*) Write down assembly language program for 8085 microprocessor to multiply two 8-bit numbers stored in memory location 4000H & 4001H. Store the result in 5000H & 5001H memory location. [10]

(*b*) Write a short note on stack organization in 8085. [8]

Or

4. (*a*) What are the various hardware interrupts ? State their vector locations and priority in 8085. [10]

(*b*) Explain with timing diagram the operation of ALE and Ready signals. [8]

5. (*a*) Explain in detail various data transfer schemes. [8]

(*b*) Explain RS232 standard in detail. [8]

Or

6. (*a*) Explain synchronous type parallel data transfer techniques. [8]

(*b*) State various bus interface standards and explain in detail RS-232. [8]

SECTION II

7. (*a*) Draw functional block diagram of 8254 and explain function of each block. [8]

(*b*) List the operating modes of 8255. Write an assembly language program to set and reset PC2 bit after 5 ms. Assume delay subroutine is available. [8]

Or

8. (*a*) Draw and explain the functional block diagram of 8255 PPI. [8]

(*b*) Explain mode 0 and mode 1 operational of 8254. [8]

9. (*a*) Draw DAC interfacing diagram with 8085 and write an assembly language program to generate sawtooth signal. [10]

(*b*) How is energy measured using 8085 ? Explain with block diagram. [8]

Or

10. (*a*) How is frequency measured using 8085 ? Explain with block diagram. Draw the flow chart. [10]

(*b*) How power factor is measured using 8085 ? Explain with block diagram. [8]

11. (*a*) With the help of interfacing diagram, explain temperature measurement using 8085 microprocessor. [8]

(*b*) With the help of interfacing diagram, explain speed measurement using 8085. [8]

Or

12. (*a*) Draw and explain stepper motor control using 8085. [8]

(*b*) With a neat diagram explain the measurement of flow using 8085. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-9

S.E. (Instru. & Control) 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 books.

(*iii*) Neat diagrams must be drawn wherever necessary.

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

(*v*) Your answers will be valued 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.

SECTION I

1. (*a*) Explain the operation of MUX-DEMUX IC CD4051 along with neat diagram. [10]

(*b*) Explain with neat circuit diagram 3-bit Flash type Analog to Digital Converter circuit. [8]

P.T.O.

Or

2. (*a*) Explain Integrator type ADC with suitable block diagram. [10]

(*b*) Explain with neat diagrams and waveforms S/H circuit. [8]

3. (*a*) Design a binary-weighted register type DAC using Op-Amp IC 741 for the digital input Signal of 1111. Assume one binary equal to 5 V, R1 = 10 kΩ, R2 = 5 kΩ, R3 = 2.5 kΩ R4 = l 25 kΩ and feedback resistor R_f = 1.5 kΩ. [8]

(*b*) Explain binary weighted register type DAC with suitable circuit diagram. [8]

Or

4. (*a*) Explain 4-bit R-2R type DAC with output equations and neat diagram. [8]

(*b*) Explain the four parameters which serves to describe the quality of performance of a DAC. [8]

5. (*a*) Explain the SCR characteristics with neat diagrams. [8]

(*b*) Explain the characteristics of MOSFET with neat diagrams. [8]

Or

6. (*a*) Explain any *one* each firing method of SCR in detail. [8]

(*b*) How is DIAC used to fire TRIAC ? Explain with neat circuit diagram. [8]

SECTION II

7. (*a*) How is the energy stored in the form of chemical compound in batteries ? Explain [6]

(*b*) Explain the safety circuit used inside lithium-ion battery. [6]

(*c*) What are different performance specifications of batteries ? Explain any *three*. [6]

Or

8. (*a*) Why are lithium-ion batteries recently used ? Justify. [6]

(*b*) Explain any *three* battery charging method with details. [6]

(*c*) How are solar cells used with battery ? Explain with suitable application. [6]

9. (*a*) A pressure transmitter gives output in the range of 4 to 20 mA. Design I to V circuit that gives output in the range of +1 to +10 Volts. [8]

(*b*) What is PLL ? Explain captured range, locked range and tracking range of PLL. [8]

Or

10. (*a*) Derive output current equation of V to I with grounded load with neat circuit diagram. [8]

(*b*) Explain the voltage to frequency conversion technique with neat block diagram. [8]

11. (*a*) In wireless data transmission, how frequency modulation is used ? Explain. [8]

(*b*) Explain ASK with neat diagrams. [8]

Or

12. (*a*) Describe the concept of TDM with suitable diagrams. [8]

(*b*) What is modulation ? Explain AM in detail. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-11

S.E. (Instru. & Cont.) (Second Semester) EXAMINATION, 2017

PHOTONICS & INSTRUMENTATION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer 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 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 define IR and UV range. [6]

(*b*) Differentiate between the following terms : [10]

(*i*) Reflection and Refraction

(*ii*) Diffraction and Interference

Or

2. (*a*) Differentiate between the following terms : [10]

(*i*) Reflection and Refraction

(*ii*) Absorption and Transmission

(*b*) Describe wavelength in meter and Angstrom. Light is having frequency range of 3.4×10^{13} Hz. [6]

P.T.O.

3. (*a*) With neat diagram explain Sodium discharge lamp. Enlist advantages and application. [10]

(*b*) Explain units used for calculation of point light source Photometry. [6]

Or

4. (*a*) With neat diagram explain the construction and working of incandescent lamp. [8]

(*b*) Compare different types of Spectra. [8]

5. (*a*) What is electroluminescent process of LED ? List out applications. [6]

(*b*) What do you understand by a term radiation pattern of emitting diode ? Suggest experimental set up and procedure to draw it . [12]

Or

6. (*a*) Explain the following terms of LASER : [12]

(*i*) Parts of LASER

(*ii*) Properties of LASER

(*iii*) Stimulated emission

(*b*) Explain in short IR Sources. [6]

Section–II

7. (*a*) Define concept of Thermal Detector. List out the types of Thermal detector. [6]

(*b*) Explain in short : [10]

(*i*) Phototransistor

(*ii*) IR detectors

Or

8. (*a*) Explain any *one* type of Quantum detector with suitable diagram. [4]

(*b*) Explain in short : [6×2]

(*i*) Photomultiplier Tube

(*ii*) Solar cell

9. (*a*) Explain the diffraction grating equation with its application. Suggest experimental set up to determine the unknown wavelength. [10]

(*b*) Compare the different optical filters. [6]

Or

10. (*a*) List out the different applications of filter. [4]

(*b*) Write short notes on : [2×6]

(*i*) Beam Splitter

(*ii*) Polarizers

11. (*a*) Explain working principle of Astronomical Telescope with suitable diagram. [9]

(*b*) Explain working of Abbes Refractometer with suitable diagram. [9]

Or

12. (*a*) Explain with neat diagram construction of Camera. [9]

(*b*) Explain with neat diagram Optical Projection system. [9]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-12

S.E. (Instrumentation & Control) (II Sem.) EXAMINATION, 2017

DRIVES AND CONTROL

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *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 chart, electronic pocket calculator is allowed.

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

SECTION I

1. (*a*) With a neat diagram explain the construction of DC generator. [8]

(*b*) Derive the EMF equation for DC generator. [8]

Or

2. (*a*) Explain the voltage equation of motor and the condition for maximum power. [8]

P.T.O.

(*b*) A long shunt compound generator delivers a load current of 50 A at 500 V and has armature series field resistances of 0.05 ohm, 0.03 ohm and 250 ohm respectively. Calculate the generated voltage and the armature current. Consider contact drop of 1 V per brush. [8]

3. (*a*) Derive the EMF equation of the alternator. [8]

(*b*) A 3-phase four-pole alternator has a stator winding with 9 conductors per slot. The armature has total 36 slots. What will be value of induced EMF when alternator is driven at 1800 rpm with 0.04 Wb/pole flux. Assume full pitch coil. [8]

Or

4. (*a*) Explain in detail the torque and slip characteristics. [8]

(*b*) Explain the construction and working principle of synchronous motor. [8]

5. (*a*) Explain detailed construction of stepper motor. [8]

(*b*) List the types of stepper motor. With the help of neat diagrams explain the characteristics of various stepper motors. [10]

Or

6. Write short notes on : [18]

(*a*) Switched Reluctance Motor

(*b*) Characteristics of induction motors

(*c*) Speed control of Universal motors.

SECTION II

7. (*a*) Explain the construction of SCR in detail. Why is gate triggering necessary in SCR ? [8]

(*b*) Explain the different modes of operation of the thyristor based on its characteristics. [8]

Or

8. (*a*) Explain in detail the construction and working of IGBT. [8]

(*b*) Explain SCR and TRIAC based on the following points : [8]

(*i*) symbol

(*ii*) operation

(*iii*) characteristics.

9. (*a*) Explain the principle of operation of chopper. [8]

(*b*) List and draw the different types of chopper circuits. [8]

Or

10. (*a*) With a neat diagram explain the working of half bridge inverter with inductive load. [8]

(*b*) How are choppers classified ? Explain class B chopper in detail. [8]

11. (*a*) State the methods for speed variation of the induction motors. Explain any *one* in detail. [10]

(*b*) Write a short note on close loop control of induction motor. [8]

Or

12. Write short notes on : [18]

(*a*) Three phase SCR drive in DC motor control

(*b*) Close loop control system for DC motor control.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-13

S.E. (Computers/IT) (First Semester)

EXAMINATION, 2017

HUMANITIES AND SOCIAL SCIENCE

(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.

(*iii*) Neat labeled diagrams must be drawn wherever necessary.

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

Section-I

1. (*a*) What are the main features of sociological perspective population. [4]

(*b*) What is the role of caste in contemporary India ? [4]

(*c*) What are features of class system ? [4]

(*d*) State the types of Migration. [4]

Or

2. (*a*) What are different aspects and elements of Indian culture ? [4]

(*b*) List the *four* problems faced by modern family. [4]

(*c*) Elaborate various causes of social, environmental, technological, cultural, economic changes. [8]

P.T.O.

3. (*a*) What are salient features of national population policy 2000 ? [8]

(*b*) State the salient features of the social system in British India and in Independent India. [8]

Or

4. (*a*) What is the role of Federal Govt. in social development ? [4]

(*b*) List the effects of industrial revolution in India. [4]

(*c*) Explain male-female ratios, total fertility rate, Infant mortality rate. [8]

5. (*a*) Explain Green revolution effects in different countries. List basic features of Green revolution. [8]

(*b*) Brief about past, present and future of communication revolution in India. Summarize its effects in human life. [10]

Or

6. (*a*) Compare the industrial Revolution of America with India. [8]

(*b*) Illustrate with diagram the consumer protection system in India. Also list the points regarding consumer awareness. [10]

Section-B

7. (*a*) Explain biotic and abiotic components of ecosystem with examples. [8]

(*b*) Cooling towers are used in many industrial plants as a means for increasing water recycles within plant. Outline and brief the advantages and disadvantages of this approach. [8]

Or

8. (*a*) What is the difference between epidemiological and toxicological studies ? Give specific examples. [8]

(*b*) What is Kyoto protocol ? List the main *five* concepts of Kyoto protocol. [8]

9. (*a*) Compare planned economy with free markets economy. List *four* challenges before Indian economy. [8]

(*b*) What are methods for calculating inflation rate and explain control strategies. [8]

Or

10. (*a*) What is elasticity of demand ? Explain with neat diagram/ graph : [8]

(*i*) Perfectly elastic demand

(*ii*) Elastic demand

(*iii*) Inelastic demand

(*iv*) Perfectly inelastic demand.

(*b*) Explain economy during colonial economy and independance India. [8]

11. (*a*) What is the significance of financial analysis ratios ? Explain the following : [10]

(*i*) Liquidity ratio

(*ii*) Leverage ratio

(*iii*) Profitability ratio

(*iv*) Shareholders ratio.

(*b*) Explain export-import and trade balance as percentage of the GDP. [8]

Or

12. (*a*) Explain the concept of break-even analysis with neat graph. What is its significance ? [10]

(*b*) Describe the functions of industrial policy and promotion department. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**5**

Seat No.	

[5152]-14

S.E. (Computer Engineering) (I Sem.) EXAMINATION, 2017

PROGRAMMING AND PROBLEM SOLVING

(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*) Write a short note on top down design. [6]

(*b*) Develop a flow chart for the instructions for withdrawing money from an ATM machine. Be sure to include all steps such as card validation. [8]

(*c*) State and explain any *four* difficulties with problem solving. [4]

P.T.O.

Or

2. (*a*) What do you mean by Flowchart ? Give the meaning of each symbol used in flowchart. Draw a flow chart to compute sum of elements from a given integer array. [8]

(*b*) Evaluate for P=true, Q=true, R=false, S=false : [4]

(*i*) A=(P AND Q) OR R

(*ii*) A=Q OR S AND P

(*iii*) A=NOT P OR NOT Q AND S

(*iv*) A=P AND NOT R OR NOT S.

(*c*) What is function ? Explain any *two* types of functions. [6]

3. (*a*) What do you mean by cohesion and coupling ? How are these important to Programmers ? [6]

(*b*) Take three integers and find the minimum integer among three. Create a decision table to solve this problem. [4]

(*c*) What are the *two* ways to send data from one module to another through the use of parameters with a suitable example ? [6]

Or

4. (*a*) Using first positive and then negative logic, write the algorithm and draw flow charts for the following set of conditions : [12]

R=50 for S<1000

R=100 for S=1001–4000

R=250 for S=4001–8000

R=75 for S>800.

(*b*) Name the major types of modules and explain their function. [4]

5. (*a*) Design an algorithm that for the integers in the range 1 to 100 finds the number that has the most divisors. [8]

(*b*) Design an algorithm for exchanging values of two variables. Explain *one* application in detail in which we use this algorithm. [8]

Or

6. (*a*) Design pseudo algorithm that converts binary numbers to octal. [8]

(*b*) Given an integer *n* devise pseudo algorithm that will find its smallest exact divisor other than one. [8]

SECTION II

7. (*a*) Write a pseudo algorithm for removal of duplicates from an ordered array. [8]

(*b*) Design an algorithm to find the second largest value in an array of *n* elements. [8]

Or

8. (*a*) Design an algorithm to search an integer number from an array of 'N' elements. Use binary search. [8]

(*b*) Write pseudo algorithm to rearrange the elements in an array so that they appear in reverse order. [8]

9. (*a*) Explain algorithm for text line length adjustment. [8]

(*b*) Explain algorithm for left right justification of given text. [8]

Or

10. (*a*) Write pseudo algorithm for linear pattern search. [8]

(*b*) Design and implement an algorithm that reverses the justification process by removing multiple blanks. Paragraph indentations should be preserved. [8]

11. (*a*) Write a C++ program, to find the average of five numbers. [6]

(*b*) Explain essential characteristics of an object oriented programming language. [4]

(*c*) Write a program in C++ for a Video CD Library that need to track Customers, Video CD's and its rentals and late fees : [8]

(*i*) Design classes you would create the application.

(*ii*) Write what methods would be needed for the classes.

(*iii*) Print the customer and its rentals.

Or

12. (*a*) Explain the following concepts : [8]

(*i*) Parameterized constructors

(*ii*) Copy constructor

(*iii*) Destructor

(*iv*) Encapsulation and Data Abstraction.

(*b*) Explain with a suitable example how code reusability is achieved in C++. [6]

(*c*) Explain the following terms : [4]

(*i*) Access specifier

(*ii*) Static member functions.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-15

S.E. (Comp.) (II Sem.) 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 internal architecture of 8086 microprocessor. [8]

(*b*) How does 8086 convert a logical address into a physical address ? [8]

Or

2. (*a*) Draw and explain the memory write timing cycle of 8086 microprocessor in maximum mode. [8]

(*b*) Compare memory mapped I/O and I/O mapped I/O. [8]

P.T.O.

3. (*a*) Explain the various addressing modes of 8086 along with *one* example each. [8]

(*b*) Write an 8086 assembly language program for the addition of first 10 numbers. [8]

Or

4. (*a*) Explain the following instructions for 8086 microprocessor : [8]

(*i*) PUSH

(*ii*) IMUL

(*iii*) CALL

(*iv*) SAR.

(*b*) Explain the following assembler directives : [8]

(*i*) EQU

(*ii*) ENDP and ENDM

(*iii*) ASSUME

(*iv*) LABEL.

5. (*a*) Draw and explain internal block diagram of 8259. [10]

(*b*) Draw and explain structure of PSP. [8]

Or

6. (*a*) What is IVT ? Explain its structure in detail. [10]

(*b*) What is the difference between DOS and BIOS calls ? [8]

SECTION II

7. (*a*) Explain BSR and I/O mode of 8255 with appropriate control word format. [8]

(*b*) Write a program to blink port C bit 2 of 8255. Assume address of control word register of 8255 as 83H. [8]

Or

8. (*a*) Draw and explain functional block diagram of 8251. [8]

(*b*) Write instruction sequence to program 8251 for asynchronous transmission with 8 data bits, 2 stop bit and no parity with 9600 baud rate. [8]

9. (*a*) Explain different I/O modes available in 8279. [8]

(*b*) Explain mode 1 and mode 3 with timing diagram. [8]

Or

10. (*a*) What is DMA ? Explain various modes in detail. [8]

(*b*) Draw and explain in brief 8279. [8]

11. (*a*) Draw and explain 8087 NDP. [10]

(*b*) Draw and explain maximum mode configuration of 8086 microprocessor. [8]

Or

12. (*a*) Draw and explain status word and control word of 8087 NDP. [10]

(*b*) Explain the use of 8284 and 8286 in interfacing memory with 8086. [8]

Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[5152]-101

S.E. (Civil) (First Semester) EXAMINATION, 2017
BUILDING TECHNOLOGY & MATERIALS
(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*) Assume suitable data, if necessary.

1. (*a*) Explain failure of foundation and its causes. What are the merits of 'Mat foundation' ? [6]
(*b*) What are the requirements of Good Formwork ? [6]

Or

2. (*a*) Explain the Construction procedure of hollow concrete blocks masonry. [6]
(*b*) Write a short note on Types of Building groups as per National Building Code [6]

3. (*a*) What are the different types of tests conducted on flooring materials ? [6]
(*b*) List out the different types of door with its specific use. [6]

Or

4. (*a*) Compare between GI sheet and AC sheet (minimum appropriate six points). [6]
(*b*) List out the different types of truss with its specific use. [6]

5. (*a*) Explain in detail design considerations of staircase. [6]

(*b*) Write a short note on Types of Plaster and modern material for plaster. [7]

Or

6. (*a*) Write a short note on Wall cladding. [7]

(*b*) Write a short note on Types of Lintel and its necessity. [6]

7. (*a*) Write a short note on Classification of Timber. [7]

(*b*) Enlist the engineering properties of : [6]

(*i*) Glass

(*ii*) Aluminum.

Or

8. (*a*) What do you understand by 'seasoning of timber' ? Explain any *one* method of seasoning in detail. [7]

(*b*) What are the different safety measures at construction site ? [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+1**

Seat No.	

[5152]-102

S.E. Civil (First Semester) EXAMINATION, 2017
STRENGTH OF MATERIAL
(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 sketches must be drawn wherever necessary.

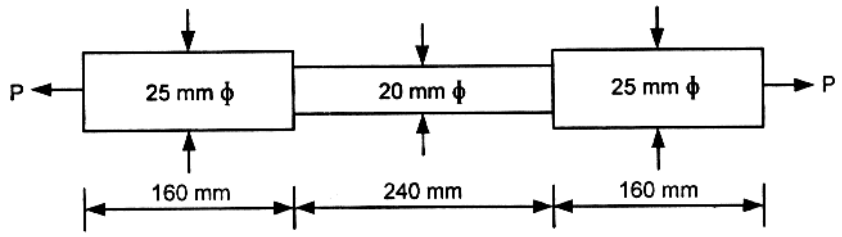
(*iii*) Figures to the right indicate full marks.

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

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Use of cell phone is prohibited in the examination hall.

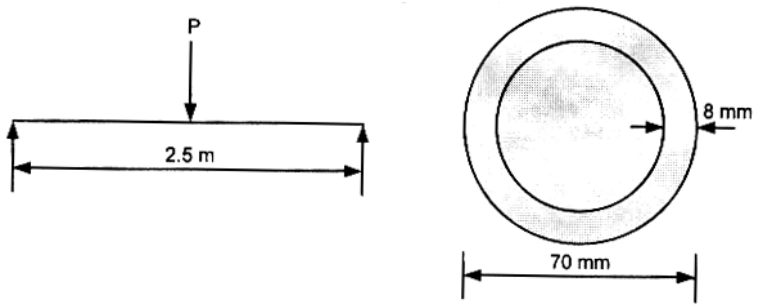
1. (*a*) The bar is tested in a Universal Testing Machine. It is observed that at a load of 40 kN the total extension of the bar is 0.285 mm. Determine the Young's modulus of the bar material. (Fig given below). [6]



(*b*) A circular pipe of External diameter 70 mm and thickness 8 mm is used as a simply supported beam over an effective span of 2.5 m. Find the maximum concentrated load that can

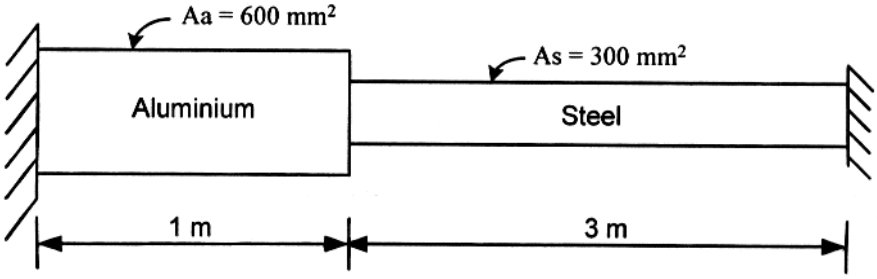
P.T.O.

be applied at the centre of the span if the permissible stress in the tube is 150 N/mm^2. (Fig. given below). [6]



Or

2. (*a*) A composite bar is rigidly fitted at the supports A & B as shown in figure. Determine the reactions at the supports when the temperature rises by 20°C. Take E_a = 70 GN/m^2, E_s = 200 GN/m^2, α_a = 11 × 10^{-6}/°C and α_s = 12 × 10^{-6}/°C. [6]



(*b*) A T section 100 mm × 130 mm × 20 mm is subjected to a shear force of 100 kN. Draw the shear stress distribution and find the maximum shear stress. [6]

3. (*a*) A hollow shaft transmits 100 kW at 120 r.p.m. Allowable shear stress in material is 50 N/mm^2. Shaft shall not twist 2° in 1 m length. Ratio of internal diameter to external diameter is 0.25. Take G = 80 kN/mm^2. Maximum torque is 15 % more than Mean torque. Calculate maximum external diameter of a shaft. [6]

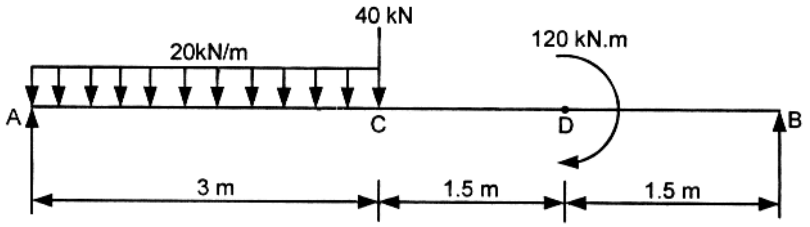
(*b*) At a point in a beam the normal stress along the length is 80 N/mm^2. The stress at that point is positive magnitude of 35 N/mm^2. Find the stresses on a plane whose normal is inclined at 30° to the longitudinal axis. Also find the principal stresses and planes on which they act. [6]

Or

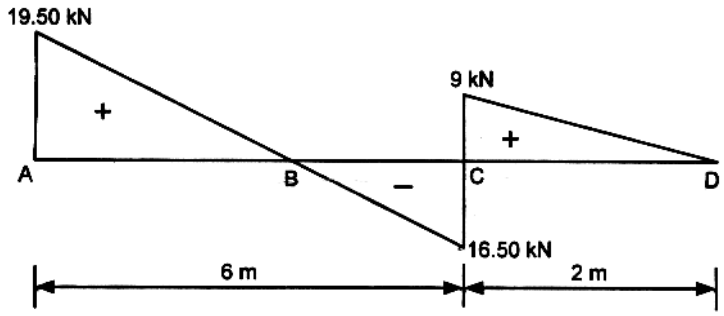
4. (*a*) A load of 500 N falls freely through a height of 150 mm on to a collar attached to the end of a vertical rod of 50 mm diameter and 2 m long, the upper end of the rod being fixed to the ceiling. Calculate the maximum instantaneous extension of the bar and also calculate the maximum stress in the bar. Assume E = 200 GPa. [6]

(*b*) What is meant by torque and state the assumptions made in the determination of shear stress in circular shafts subjected to torsion ? [6]

5. (*a*) Draw Shear Force Diagram & Bending Moment Diagram of a simply supported beam as shown in figure below. [7]

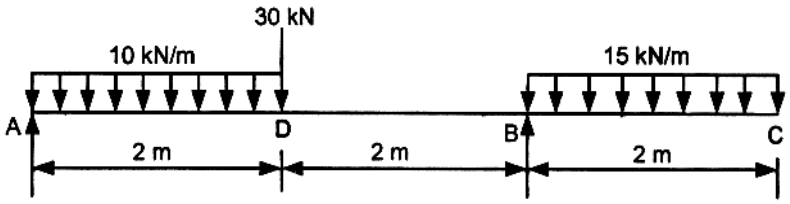


(*b*) Draw the loading diagram & bending moment diagram from the given shear force diagram of a beam as shown in figure below. [6]

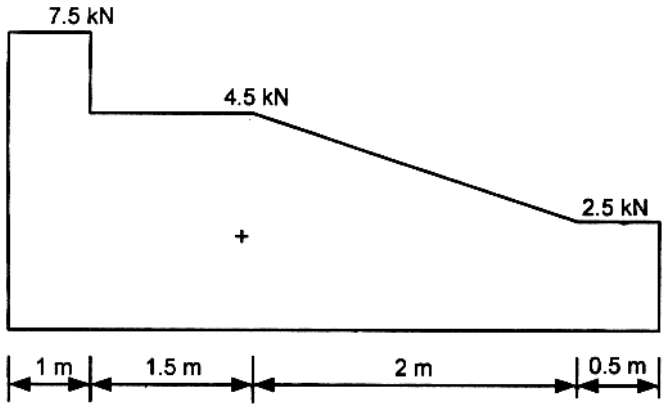


Or

6. (*a*) Draw Shear Force Diagram and Bending Moment Diagram of a simply supported beam as shown in figure below. [7]



(*b*) Construct loading diagram for the following shear force diagram for a beam as shown in Fig. below. [6]



7. (*a*) Calculate the safe compressive load on hollow C.I. column with one end fixed and other end hinged. The column having a 150 mm external diameter and 100 mm internal diameter and 10 m length. Use Euler's Formula with factor of safety 5. Take E = 95 × 10^3 N/mm^2. [6]

(*b*) A hollow C.I. column whose outside diameter is 250 mm has a thickness of 15 mm. It is 4.5 m long and is fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety 4. Calculate slenderness ratio and Rankine's critical load. Take σ_c = 550 N/mm^2, $a = \frac{1}{1600}$ and Take E = 9.4 × 10^4 N/mm^2. [7]

Or

8. (*a*) A rectangular column of 240 mm × 150 mm is subjected to a vertical load of 10 kN placed at an eccentricity of 60 mm in a plane bisecting 150 mm side. Determine the maximum & minimum stress intensities in the section. [6]

(*b*) A masonry pillar 8 m high is 1.5 m × 2.5 m in section, a horizontal wind pressure of 1.4 kN/m^2 acts on the 2.5 m × 8 m face. Find the maximum and minimum stress intensities induced on the base section. The weight of masonry is 22.5 kN/m^3. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-103

S.E. (Civil) (First Sem.) EXAMINATION, 2017

GEOTECHNICAL ENGINEERING

(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 calculator is allowed

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

1. (*a*) Write short note on transported soils with examples. [6]

(*b*) In falling head test a sample of soil having 75 mm diameter and 55 mm length was tested. At start, initial head was 80 cm and after one hour, the head was 40 cm. Find the coefficient of permeability if the diameter of stand pipe is 1 cm. [6]

Or

2. (*a*) Explain the procedure of flow net construction for seepage below a sheet pile and write the expression for determination of seepage. [6]

P.T.O.

(*b*) A partially saturated soil from an earth fill has a natural water content of 19% and bulk unit weight of 19.33 kN/m^3. Assuming, G = 2.6, determine the degree of saturation, void ratio and porosity. [6]

3. (*a*) What is significant depth and pressure bulb ? Explain with neat sketch. [6]

(*b*) A cohesive soil has an angle of shearing resistance of 15^6 and cohesion of 35 kN/m^2. 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 kN/m^2. [6]

Or

4. (*a*) An embankment was constructed by compacting a soil at a moisture content of 18% and a dry density of 16.27 kN/m^3. If G = 2.7, determine the void ratio and degree of saturation of the embankment soil. [6]

(*b*) Draw Mohr circle for direct shear test and show principal plane, principal stress, failure plane, strength envelope and C, ϕ on the sketch. [6]

5. (*a*) Determine the active thrust on retaining wall when uniform surcharge acts on the ground. [7]

(*b*) Explain the Culmann's graphical method for determination of active earth pressure. [6]

Or

6. (*a*) What is critical height ? State the expression. Determine 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^3, $C = 14$ kN/m^2, $\phi = 12^o$ [7]

(*b*) State assumptions in Rankine's theory of earth pressure and explain the concept of plastic equilibrium. [6]

7. (*a*) Explain how the soil acts as a geochemical trap. [6]

(*b*) What are the different forms of unstability for clayey soil ? Explain with sketches. [7]

Or

8. (*a*) How is decontamination using chemicals carried out ? [6]

(*b*) Discuss the causes and remedies of Landslides. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-104

S.E. (Civil) (I Sem.) EXAMINATION, 2017

SURVEYING

(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*) Assume suitable data, if necessary.

(*v*) Use of electronic pocket calculator is allowed in the examination.

(*vi*) Use of cell phone is prohibited in the examination hall.

1. (*a*) Which are the likely error in plane table surveying ? Explain how to eliminate them. [6]

(*b*) The following readings were observed during a reciprocal leveling with one level : [6]

Instrument at	**Staff Readings on**		**Remark**
	P	**Q**	
P	1.425	2.724	Distance between
Q	1.429	2.504	A & B is 1150 m

P.T.O.

Find :

(*i*) the true R.L. of B, if R.L. of A = 500.187 m

(*ii*) the combined correction due to curvature and refraction

(*iii*) the error in the collimation adjustment of the instrument

Or

2. (*a*) Find the included angles of the closed traverse PQRSP and correct them for local attraction, if any. [6]

Line	**PQ**	**QR**	**RS**	**SP**
F.B.	36°10'	109°20'	159°30'	270°20'
B.B.	216°10'	288°40'	341°10'	89°20'

(*b*) The eye of an observer is 10 m above the ground. He was able to see the top of a light-house 60 m high just at the level of the horizon. Determine the distance of observer from light-house. [6]

3. (*a*) Define the following terms : [6]

Swinging, Bubble up, Transiting, Vertical axis

(*b*) Two tangents intersect at chainage of 1192 m with deflection angle of 50°30'. Calculate the necessary data for setting out a curve with radius of 300 m by offset from chord produced method. Take peg interval as 30 m. [6]

Or

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

Line	**AB**	**BC**	**CD**	**DA**
Length (m)	230.5	250.2	210.5	—
Bearing	N36°45'E	S82°48'E	S10°15'E	—

(*b*) What are transition curves ? Explain its requirement. [6]

5. (*a*) Enlist and explain the temporary adjustments of a theodolite. [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**
	P	+3°15'	1.355, 2.580, 3.935
A	Q	–1°15'	0.985, 1.660, 2.335

Determine the RL of Q. Take R.L. of P = 100.000 m. Also determine distance PQ if horizontal angle PAQ = 68°30'.

Or

6. (*a*) Explain the basic principle of tacheometry with sketch. [4]

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

(*c*) Readings on a vertical staff are taken from a station O which is 30 m from A and 60 m from B. The stadia readings on staff at A are 1.135, 1.284, 1.433 and that on staff at B are 1.025, 1.325, 1.624. Determine the instrument constants. [5]

7. (*a*) Enlist the major functions that can be performed by Electronic Total Station (ETS). [6]

(*b*) Write a short note on Tunnel survey with respect to transferring the alignment through shafts, with sketch. [7]

Or

8. (*a*) Explain the points to be kept in mind when road project is to be carried out with respect to necessity and marking the tentative alignment of road. [6]

(*b*) What is ETS ? Explain the basic features of a total station. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**5**

Seat No.	

[5152]-105

S.E. (Civil) (I Sem.) 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 : [8]

(*i*) $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 2\cos x + 3x + 2 + 3e^x$

(*ii*) $x^3\frac{d^3y}{dx^3} + 2x^2\frac{d^2y}{dx^2} + 2y = 10\left(x + \frac{1}{x}\right)$.

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

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = \frac{e^{3x}}{x^2}.$$

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

$$\begin{aligned} 2x + y + z &= 10 \\ 3x + 2y + 3z &= 18 \\ x + 2y + 9z &= 34. \end{aligned}$$

P.T.O.

Or

2. (*a*) Apply Runge-Kutta method of 4th order to solve the differential equation : [4]

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

to find $y(0.2)$ with $h = 0.2$.

(*b*) Solve the system of simultaneous symmetric equations : [4]

$$\frac{dx}{3z - 4y} = \frac{dy}{4x - 2z} = \frac{dz}{2y - 3x}.$$

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

$$4x + 2y + 14z = 14$$
$$2x + 17y - 5z = -101$$
$$14x - 5y + 83z = 155.$$

3. (*a*) Obtain correlation coefficient between population density (per square miles) and death rate (per thousand persons) from data related to 5 cities : [4]

Population Density	**Death Rate**
200	12
500	18
400	16
700	21
800	10

(*b*) In a certain factory turning out razor blades, there is a small chance of 1/500 for any blade to be defective. The blades are supplied in a packet of 10. Use Poisson distribution to calculate the approximate number of packets containing no defective and two defective blades, in a consignment of 10,000 packets. [4]

(*c*) If directional derivative of $\phi = ax^2y + by^2z + cz^2x$ at (1, 1, 1) has maximum manitude 15 in the direction parallel to $\frac{x-1}{2} = \frac{y-3}{-2} = \frac{z}{1}$, hence find the values of a, b, c. [4]

Or

4. (*a*) The first four moments of a distribution about $x = 2$ are 1, 2.5, 5.5 and 1.6. Calculate first four moments about mean. Also find β_1 and β_2. [4]

(*b*) Prove the following (any *one*) : [4]

(*i*) $\nabla \times \left(\frac{\bar{a} \times \bar{r}}{r^3} \right) = -\frac{\bar{a}}{r^3} + \frac{3(\bar{a} \cdot \bar{r})}{r^5}\bar{r}$

(*ii*) $\nabla^2 f(r) = \frac{d^2f}{dr^2} + \frac{2}{r}\frac{df}{dr}$.

(*c*) If the vector field $\bar{F} = (x + 2y + az)\bar{i} + (bx - 3y - z)\bar{j} + (4x + cy + 2z)\bar{k}$ is irrotational, find a, b, c and determine ϕ such that $\bar{F} = \nabla\phi$. [4]

5. (*a*) Evaluate $\int_C \bar{F} \cdot d\bar{r}$ for $\bar{F} = (2y + 3)\bar{i} + xz\bar{j} + (yz - x)\bar{k}$ along the straight line joining (0, 0, 0) and (3, 1, 1). [4]

(*b*) Evaluate $\iint_S (\nabla \times \bar{F}) \cdot d\bar{S}$ for $\bar{F} = -y^3\bar{i} + x^3\vec{j}$ and closed curve 'C' is boundary of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. [4]

(*c*) Use Gauss-divergence theorem to evaluate :

$\iint_S \left(x^3\vec{i} + y^3\vec{j} + z^3\bar{k} \right) \cdot d\bar{S}$ where S is the surface of the sphere $x^2 + y^2 + z^2 = 9$. [5]

Or

6. (*a*) Evaluate $\int \bar{F} \cdot d\bar{r}$ using Green's theorem where, $\bar{F} = (2x^2 - y^2)\vec{i} + (x^2 - y^2)\vec{j}$ and C is the circle $x^2 + y^2 = 1$ above x-axis. [4]

(*b*) Using Stokes' theorem evaluate $\int_C \bar{F} \cdot d\bar{r}$ where $\bar{F} = y^2\vec{i} + x^2\vec{j} - (x + z)\vec{k}$ and 'C' is the boundary of triangle with vertices (0, 0, 0), (1, 0, 0) and (1, 1, 0). [4]

(*c*) Prove that $\iiint_V \frac{dV}{r^2} = \iint_S \frac{\bar{r} \cdot \hat{n}}{r^2} dS$ where, V is the volume bounded by closed surface S. [5]

7. (*a*) Solve the wave equation $\frac{\partial^2 y}{\partial t^2} + C^2 \frac{\partial^2 y}{\partial x^2}$ subjected to the conditions : [6]

(*i*) $y(0, t) = 0$ for all t

(*ii*) $y(l, t) = 0$ for all t

(*iii*) $\left(\frac{\partial y}{\partial t}\right)_{t=0} = 0$

(*iv*) $y(x, 0) = k(lx - x^2)$, for $0 \leq x \leq l$.

(*b*) An infinitely long uniorm metal plate is enclosed between the lines $y = 0$ to $y = l$ for $(x > 0)$. The temperature is zero along the sides $y = 0$, $y = l$ and at infinite end. If the edge $x = 0$ kept at constant temperature u_0, find temperature distribution $u(x, y)$. [7]

Or

8. (*a*) Solve the one-dimensional heat flow equation : [6]

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

subjected to the conditions :

(*i*) $u(x, t)$ bounded

(*ii*) $u(0, t) = 0$ for all t

(*iii*) $u(\pi, t) = 0$ for all t

(*iv*) $u(x, 0) = x, \ 0 < x < \pi$.

(*b*) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subjected to the conditions : [7]

(*i*) $u(0, y) = 0$ for all y

(*ii*) $u(1, y) = 0$ for all y

(*iii*) $u(x, \infty) = 0$, for all x

(*iv*) $u(x, 0) = x(1 - x)$ for $0 < x < 1$.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-106

S.E. (Civil Engineering) (II Sem.) EXAMINATION, 2017

FLUID MECHANICS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer any *six* questions from 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,** Q. No. **9** *or* Q. No. **10** and Q. No. **11** *or* Q. No. **12**.

(*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. Differentiate between surface tension and capillarity. Give practical examples of each. Derive the relation showing the capillary rise or fall depends upon surface tension. [5]

Or

2. (*a*) A fluid a specific gravity of 0.83 and a kinematic viscosity of 4×10^{-4} m^2/s. What is its absolute viscosity in S.I. units ? [3]

(*b*) Define : mass density, specific weight, specific volume, relative density. [2]

P.T.O.

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]

Or

4. (*a*) Define Buoyancy and centre of Buoyancy. [2]

(*b*) A vertical square area 1 m × 1 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*) Distingusih between Uniform and non-uniform flow, give at least *one* example of each. [2]

Or

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]

Or

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]

9. (*a*) Explain Laminar sub layer. What is Boundary Layer separation and its control ? [5]

(*b*) The velocity distribution in the boundary layer is : [6]

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

∂ = thickness of boundary layer.

Calculate displacement thickness and momentum thickness.

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

Or

10. (*a*) A smooth float plate with a sharp 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 is 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]

$$\phi = \int_0^{\partial} \frac{u}{U}\left(1 - \frac{u}{U}\right) dy \quad \text{and}$$

$$\partial e = \int_0^{\partial} \frac{u}{U}\left(1 - \frac{u^2}{V^2}\right) dy.$$

(*c*) Explain Stoke's 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. [5]

(*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]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-107

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

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Solve Q. No. **1** or Q. No. **2** and Q. No. **3** or Q. No. **4** on answer sheet.
(*ii*) Solve Q. No. **5** or Q. No. **6** and Q. No. **7** or Q. No. **8** on drawing sheet only.
(*iii*) Assume suitable data if necessary.

1. (*a*) Write a note on : [6]
(*i*) Profit and non profit zones
(*ii*) Density zones.
(*b*) Enlist different principles of architectural planning and elaborate any two with sketches. [7]

Or

2. (*a*) Write short notes on TDR. [6]
(*b*) Explain the importance of earthquake resistant structures in today's context. [7]

3. (*a*) The internal dimensions of a tile manufacturing unit are 40×20×5m. The number of air changes available are 5. The indoor temperature is 35ºC and outdoor is 30ºC. Find the area of openings if the distance between inlet and outlet openings is 2.5m. [6]
(*b*) Write a short note on solar energy and its applicability and importance. [6]

P.T.O.

Or

4. (*a*) Explain with sketch, "Layout of water supply." [6]

(*b*) Explain with sketch : [6]

(*i*) Centre of vision

(*ii*) VPL.

5. Draw a detailed floor plan to a scale of 1 : 50 or otherwise using following data : [13]

(*i*) LR - 15m^2 (1 in No.)

(*ii*) Kitchen + Dining – 9m^2

(*iii*) M.B.R. – 15m^2 + Toilet 3m^2

(*iv*) B.R. – 15m^2

(*v*) WC – 1.2 × 1m^2

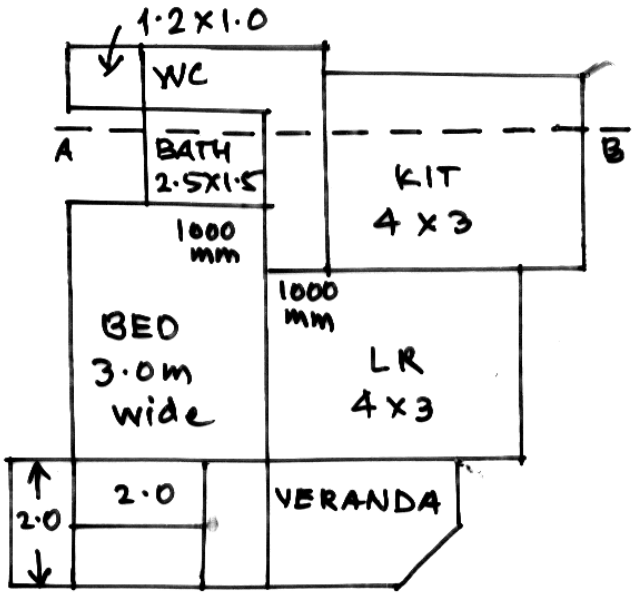
(*vi*) Bath – 1.2 × 2.1m^2

Ext. Walls-230 mm int walls-115mm.

Staircase—Assume height = 3m, R = 0.15, T = 0.25m.

Or

6. Draw a sectional elevation by referring Fig. 1 : [13]



FL TO FL HT = 2.88m

Riser HT = 0.16 T = 0.25m

Plinth HT = 0.48 *m*

Fig. 1.

7. Design a single storey hostel building for 50 Students : [12]

(*i*) 20 Rooms, Two seated with 7.5m^2/Student and 10 single seated rooms with 9m^2 area.

(*ii*) Recreation room – 35m^2

(*iii*) Gymnasium – 15m^2

(*iv*) Office area – 20m^2, assume additional suitable data. [Line plan is expected with N-line and schedule of openings.]

Or

8. Draw a line plan with N-line & Schedule of openings using following data : [12]

(1) Post Office – entrance & moving area – 30m^2

(2) Countres – 4 No, 0.7m wide

(3) Post Master's room – 15m^2

(4) Post separation room – 30m^2.

(5) Safe custody – 10m^2

(6) Cash transaction – 15m^2

(7) Assume additional suitable data.

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-108

S.E. (Civil Engineering) (II Sem.) EXAMINATION, 2017

CONCRETE TECHNOLOGY

(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*) 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*) Explain wet process of manufacturing of Portland cement. [6]

(*b*) Define workability of concrete. Explain the factors affecting workability. [6]

Or

2. (*a*) Write a short note on classification of aggregates. [6]

(*b*) Write short notes on : [6]

(*i*) Shrinkage

(*ii*) Swelling.

P.T.O.

3. (*a*) What are the test cores ? What are the advantages and disadvantages of test cores ? [6]

(*b*) Describe the different types of vibrators used for compaction of concrete. [6]

Or

4. (*a*) Write short notes on : [6]

(*i*) Light weight concrete

(*ii*) Under water concreting

(*b*) Write the comparison between Ferro cement and RCC construction work. [6]

5. (*a*) What do you mean by concrete mix design ? What are the objectives in mix design ? [6]

(*b*) Explain mix design by IS recommended guidelines in detail. [7]

Or

6. (*a*) Explain the factors affecting the mix design. [4]

(*b*) Write a short note on statistical quality control of concrete. [4]

(*c*) Briefly outline DOE method of mix design. [5]

7. (*a*) Explain in detail permeability and factors affecting permeability of the concrete. [5]

(*b*) Write short notes on : [8]

(*i*) Corrosion monitoring techniques and its preventive measures

(*ii*) Shotcrete.

Or

8. (*a*) What is evalution of cracks ? Why is it necessary ? [5]

(*b*) Write short notes on : [8]

(*i*) Attack by sea water

(*ii*) Carbonation of concrete and its determination.

Total No. of Questions—**8**] [Total No. of Printed Pages—**5**

Seat No.	

[5152]-109

S.E. (Civil) (II Sem.) EXAMINATION, 2017
STRUCTURAL ANALYSIS—I
(2012 COURSE)

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 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.

1. (*a*) Define static and kinematic indeterminacy. Determine the static and kinematic indeterminacy for propped cantilever. [6]

(*b*) Determine moment at B for the continuous beam loaded and supported as shown in Fig. 1 by three moment theorem. Assume uniform flexural rigidity : [6]

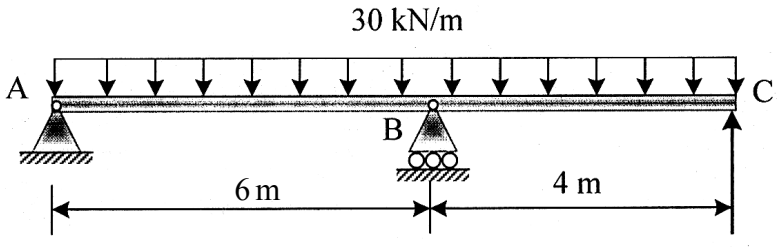


Fig. 1

P.T.O.

Or

2. (*a*) Find maximum slope and deflection for the cantilever AB loaded with uniformly distributed load 6 kN/m on entire 2 m span by moment are method. Assume uniform flexural rigidity. [6]

(*b*) A portal frame ABCD has hinged ends at A and D with rigid joints B and C. The columns AB and CD are 4 m height. The beam BC is 4 m long and carries a central point load 100 kN. Find the horizontal reaction at B by strain energy method. [6]

3. (*a*) Find the vertical displacement of joint C for the pin jointed truss as shown in Fig. 2. The cross sectional area of the members AC and CB are 800 mm^2 and the areas of the members AB is 1000 mm^2. Take E = 200 kN/mm^2. [6]

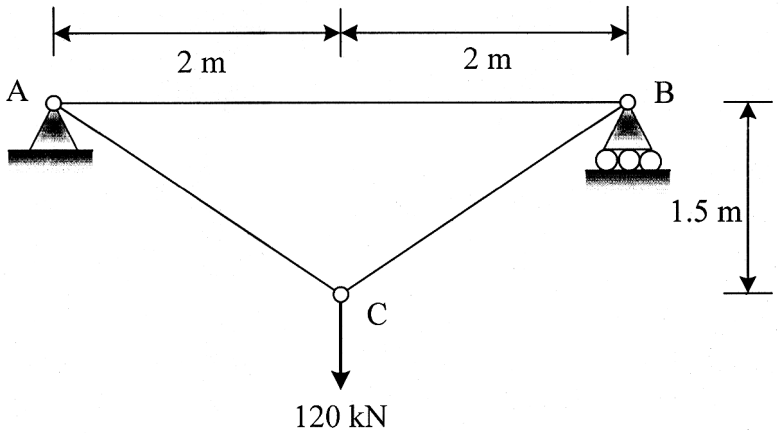


Fig. 2

(*b*) Draw influence line diagrams for 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 : [6]

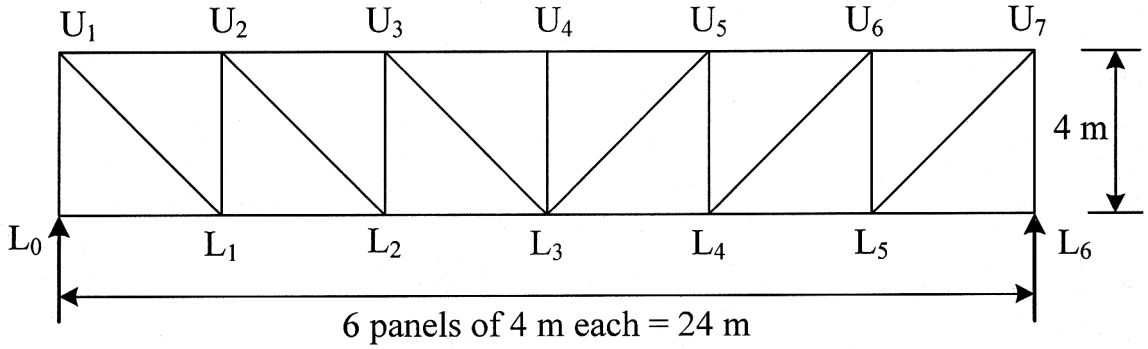


Fig. 3

Or

4. (*a*) Determine support reaction and maximum bending moment by influence line method for a simply supported beam of span 4 m loaded with central point load 50 kN. [6]

(*b*) Find forces in members of the truss as shown in Fig. 4. Cross-sectional area and material of all members is same : [6]

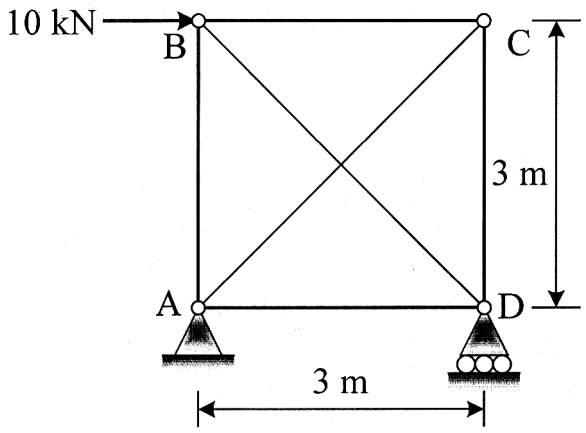


Fig. 4

5. (*a*) A three hinged parabolic arch, hinged at crown and springing has a horizontal span of 12 m and central rise of 2.5 m. It carries a uniformly distributed load of 30 kN per horizontal meter run over the left hand half of the span. Determine the reaction at the end hinges. [6]

(*b*) A two hinged semicircular arch of uniform section is hinged at 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]

Or

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

(*b*) A parabolic arch rib of span 30 m and central rise 6 m is hinged at the ends. It carries a uniformly distributed load 20 kN per horizontal meter run over 12 m from the left hinge towards the centre. Determine the horizontal thrust. [7]

7. (*a*) Draw stress distribution for elastic, elasto-plastic and platic stage. [6]

(*b*) A beam of span L fixed at one end and hinged at other end is loaded with central point load W. Find the collapse load for the beam if the plastic moment of resistance of the section is Mp. [7]

Or

8. (*a*) State and explain concept of plastic hinge and collapse mechanism with suitable example. [6]

(*b*) A propped cantilever is subjected to a uniformly distributed load w per unit length on entire span. Determine the collapse load for the beam. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-110

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

EXAMINATION, 2017

ENGINEERING GEOLOGY

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

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.

1. (*a*) Distinguish between Conglomerate and Breccias. How do they form in nature ? [6]

(*b*) What is Unconformity ? Enlist types of Unconformities. Describe any *one* with neat diagram. [6]

Or

2. (*a*) What is Metamorphism ? Make distinction between two parallel textures represented by metamorphic rocks. [6]

(*b*) Differentiate between Fracture and Fault ? Explain Reverse Fault. [6]

P.T.O.

3. (*a*) Describe depositional work done by River. [6]

(*b*) Inscribe importance of Core Drilling ? What are the limitations of drilling ? [6]

Or

4. (*a*) What are principles of stratigraphy ? Explain in detail any *two* principles. [6]

(*b*) Write a note on importance of observation during drilling process. [6]

5. (*a*) Describe any Two geological conditions leading to Artesian well ? [7]

(*b*) Write note on feasibility of Tunnelling through : [6]

(*i*) Compact Basalt

(*ii*) Amygdaloidal Basalt

Or

6. (*a*) Explain with appropriate example about feasibility of dam alignment across a Dyke. [7]

(*b*) Describe Earthquake Waves and their characteristics with diagrams. [6]

7. (*a*) What is soil creep ? What is Rock fall ? Explain natural and artificial causes of Landslides. [7]

(*b*) Describe feasibility of dam in folded areas. Draw neat diagrams. [6]

Or

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 at lower end**	**Remark**
3 m to 6 m	1	10	M	Basaltic rocks
	2	09	J	
	3	09	M	
	4	30	J	
	5	34	J	
	6	51	J	
	7	55	J	
	8	60	J	
	9	42	J	

(*b*) Elaborate Geological studies to be carried in reservoir area of dam. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**7**

Seat No.	

[5152]-111

S.E. (Mech/Prod./Automob./Sandwich) (I Sem.) EXAMINATION, 2017

ENGINEERING MATHEMATICS—III

(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 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*) $(D^2 - 6D + 13)y = e^{3x} \sin 4x$

(*ii*) $(D^2 + 4)y = \tan(2x)$, (By variation of parameters)

(*iii*) $(x^2D^2 - xD + 1)y = x \cdot \log x$.

(*b*) Find the Fourier sine transform of $e^{(-x)}$ and hence prove that : [4]

$$\int_0^\infty \frac{x \cdot \sin}{1 + x^2} mx \cdot dx = \frac{\pi}{2} \cdot e^{(-m)}.$$

P.T.O.

Or

2. (*a*) A body of weight W = 20 N, is hung from a spring. A pull of '40 N' will stretch the spring to 10 cm. The body is pulled down to '20 cm' below the static equilibrium position and then released. Find the displacement of the body from its equilibrium position in time '*t*' seconds. [4]

(*b*) Solve any *one* of the following : [4]

(*i*) Find Laplace transform of :

$$f(t) = \left\{ \frac{e^{-at} - e^{-bt}}{t} \right\}.$$

(*ii*) Find inverse Laplace transform of :

$$\mathrm{F}(s) = \frac{3s + 1}{(s - 1)(s^2 + 1)}.$$

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

$$(\mathrm{D}^2 - 2\mathrm{D} + 5)y = e^{-t} \cdot \sin t,$$

given that :

$$y(0) = 0, \quad y'(0) = 1.$$

3. (*a*) Find the values of the constant a, b, c so that the directional derivative of : [4]

$\phi = axy^2 + byz + cz^2x^2$ at (2, 1, 1) has a maximum magnitude 12 in a direction parallel to the x-axis.

(*b*) Show that : [4]

$$\overline{\mathrm{F}} = (6xy + z^3)\,\overline{i} + (3x^2 - z)\overline{j} + (3xz^2 - y)\overline{k}$$

is irrotational. Find ϕ such that $\overline{\mathrm{F}} = \nabla\phi$.

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

x	y
10	12
14	16
19	18
26	26
30	29
34	35

Or

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

(*i*) $\nabla\left(\frac{\bar{a} \cdot \bar{r}}{r^n}\right) = \frac{\bar{a}}{r^n} - \frac{n(\bar{a} \cdot \bar{r})}{r^{n+2}}\bar{r}$

(*ii*) $\nabla^2\left[\nabla \cdot \left(\frac{\bar{r}}{r^2}\right)\right] = \frac{2}{r^h}$.

(*b*) The mean height of 1000 students at certain college is 165 cm and S.D. 10 cm. Assuming normal distribution, find the number of students whose height is greater than 172 cm : [4]

[Given : $P(z > 0.7)$

$= 0.24196$]

(*c*) The first four moments of a distribution about the value 5 are 2, 20, 40 and 50. From the given information obtain the first four central moments. [4]

5. (*a*) Find the work done by : [4]

$$\overline{F} = 2xy^2\hat{i} + (2x^2y + y)\hat{j}$$

in taking a particle from (0, 0, 0)

to (2, 4, 0) along the parabola $y = x^2$, $z = 0$.

(*b*) Verify Stokes' theorem for : [5]

$$\overline{F} = y^2\hat{i} + xy\hat{j} - xz\hat{k}$$

where S is the hemisphere

$$x^2 + y^2 + z^2 = a^2, \quad z \geq 0.$$

(*c*) Evaluate : [4]

$$\iint_S (x\hat{i} + y\hat{j} + z^2\hat{k}).\, d\overline{S}$$

where S is the curved surface of the cylinder $x^2 + y^2 = 4$ bounded by the planes $z = 0$ and $z = 2$.

Or

6. (*a*) Using Green's theorem, evaluate : [4]

$$\int_C (xy - x^2)\, dx + x^2 dy$$

along the curve bounded by :

$$y = 0, \; x = 1, \; y = x.$$

(*b*) Using divergence theorem, evaluate : [5]

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

where S is the upper part of the sphere $x^2 + y^2 + z^2 = 4$.

(*c*) Evaluate : [4]

$$\iint_S \nabla \times \overline{F} \,.\, \hat{n}\, dS$$

for the surface of paraboloid

$$z = 4 - x^2 - y^2, \ (z \geq 0)$$

and

$$\overline{F} = y^2\hat{i} + z\hat{j} + xy\hat{k}\,.$$

7. Solve any *two* :

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

(*b*) Solve : [6]

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

If :

(*i*) u is finite for all t

(*ii*) $u(0, t) = 0, \ \forall \ t$

(*iii*) $u(l, t) = 0, \ \forall \ t$

(*iv*) $u(x, 0) = u_0, \ 0 \leq x \leq l$, where, l being a length of a bar.

(*c*) A rectangular plate with insulated surface is 10 cm wide and so long compared to its width that if may be considered infinite in length without introducing an appreciable error. If the temperature along short edge $y = 0$ is given by $u(x, 0) = 100 \sin\left(\frac{\pi x}{10}\right)$, while the two long edges $x = 0$ and $x = 10$ as well as the other short edge are kept at 0°C. Find steady state temperature $u(x, y)$. [6]

Or

8. Solve any *two* :

(*a*) A string is stretched and fastend to two points L aparts. Motion is started by displacing the string in the form $u = a \sin\left(\frac{\pi x}{L}\right)$ from which it is released at time $t = 0$. Find the displacement $u(x, t)$ from one end. [7]

(*b*) Solve : [6]

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

If :

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

(*ii*) $u(l, t) = 0$

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

(*iv*) $u(x, 0) = \frac{u_0}{l} x$, for $0 \leq x \leq l$.

(*c*) Solve : [6]

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

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 $0 \leq x \leq 1$.

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-112

SE. (Mech. & Automo.) (First Semester)

EXAMINATION, 2017

MANUFACTURING PROCESS-I

(2012 PATTERN)

Time : Three 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*) *All* questions are compulsory.

1. (*a*) What are different allowances applied in pattern making ? Explain. [6]

(*b*) With neat sketch explain gating system used in sand casting. [6]

Or

2. (*a*) A cylindrical riser must be designed for a sand casting mould. The size of steel casting is 40 mm × 100 mm × 10 mm. The previous observations have indicated that the total solidification time for casting is 80 sec. The cylindrical riser has (d/n) = 1, find the size of riser so that its total solidification time is 120 sec. [6]

(*b*) What is the difference between hot working and cold working ? [6]

P.T.O.

3. (*a*) With proper sketch explain Injections Moulding Process. [6]

(*b*) Explain Arc welding with merits and demerits. [6]

Or

4. (*a*) What are different types of flames in gas welding ? Explain with proper sketch. [6]

(*b*) Classify the welding process. What are its advantages ? [6]

5. (*a*) A 120 mm diameter hole is to be punched in a sheet of 6 mm thick. The material of the sheet is cold rolled steel with a shear strength of 560 MPa. With normal clearance cutting is completed at 30 percent penetration of the punch. Find :

(*i*) Diameter of the punch and die.

(*ii*) Maximum force on the punch,

(*iii*) Stripping force

(*iv*) Total work done in punching. Also estimate the amount of shear on the punch if punching force is 250 kN. [7]

(*b*) What is center of pressure ? How is it calculated ? [6]

Or

6. (*a*) What is Compound die ? Explain with proper sketch. [6]

(*b*) Explain any *two* operations performed on sheet metal in detail with proper sketches. [7]

7. (*a*) With neat sketch explain steady rest and follower rest in lathe machine. [7]

(*b*) Explain threading operation on lathe machine with neat sketch. [6]

Or

8. (*a*) Calculate machining time for a workpiece of 80 mm diameter and 120 mm length turned in 2 passes if the approach length is 14 mm and over travel is 6 mm. Given cutting speed = 4 m/min. and feed is 0.4 mm/rev. [6]

(*b*) Explain Taper turning attachment with neat sketch. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-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. 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*) Answer of the *four* questions should be written in same answer-book attach supplement if required.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of steam tables, 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.

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

1. (*a*) Apply the second law of thermodynamics to heat engines, refrigerators and heat pumps and derive the formula for efficiency or COP of the device. [6]

P.T.O.

(*b*) A mass of 0.8 kg of air at 1 bar and 25 deg. C is contained in a gas tight friction less piston cylinder device. The air is now compressed till final pressure of 5 bar. During the process, heat is transferred from the air in such a manner that temperature inside the cylinder remains constant throughout. Calculate the heat transferred, work done and change in entropy during the process and direction of each in the process. [6]

Or

2. (*a*) Prove that entropy is the property of the system. [6]

(*b*) A small turbine runs an aircraft refrigeration system. Air enters the turbine at 4 bar and 40 deg. C and velocity of 40 m/s. At the exit air is at 1 bar, 2.5 deg. C and having velocity of 200 m/s. If the work output of the turbine is 52 kJ/kg of the air, calculate the heat transferred per kg of air, Assume C_P for air 1.005 kJ/kgK. [6]

3. (*a*) Discuss the concept of Available energy, Unavailable energy and total heat input and represent the same on T-s diagram for Carnot cycle. [6]

(*b*) Determine the amount of heat that should be supplied to 2 kg of water at 25 deg. C to convert into steam at 5 bar and 0.9 dry. [6]

Or

4. (*a*) Explain with neat labeled T-s diagram Rankine vapor power cycle and derive the equation for efficiency of Rankine cycle. [6]

(*b*) An Otto cycle engine has a bore of 80 mm and stroke of 85 mm. The clearance volume of the engine is 0.06 litre. The actual thermal efficiency of the engine is 22%. Determine :

(*i*) Compression ratio,

(*ii*) Air standard efficiency,

(*iii*) Relative efficiency of the engine.

Assume, gamma = 1.4. [6]

5. (*a*) Define and explain the concept of :

(*i*) Boiler efficiency and

(*ii*) Equivalent evaporation in case of boiler plants. [6]

(*b*) The following readings were recorded during a trial of six hours duration :

(*i*) Steam pressure 12 bar,

(*ii*) Mass of steam generated 40.000 kg,

(*iii*) Mean dryness fraction 0.85,

(*iv*) Mean feed water temperature 30 deg. C,

(*v*) Coal used 4000 kg,

(*vi*) CV of coal 33400 kJ/kg.

Calculate :

(*i*) Equivalent evaporation from and at 100 deg. C.

(*ii*) Efficiency of the boiler. [7]

Or

6. (*a*) Discuss the functions and location of various boiler mounting and accessories. [6]

(*b*) Calculate the height of Chimney required to produce a draught equivalent to 1.7 cm of water of the flue gas temperature is 270 deg. C and ambient temperature is 22 deg. C and minimum amount of air per kg of fuel is 17 kg. [7]

7. (*a*) Derive the relation for minimum amount of air required per kg of fuel for complete combustion. [6]

(*b*) A fuel consists of 72% carbon, 20% hydrogen and 8% oxygen by mass. Determine stoichiometric mass of air required to burn 1 kg of fuel completely. [7]

Or

8. (*a*) Discuss the construction and working of Bombs Calorimeter with neat sketch and thus derive the formula for HCV. [6]

(*b*) Determine the air fuel ratio and the theoretical amount of air required by mass for complete combustion of a fuel containing 85% carbon, 8% hydrogen, 3% oxygen, 1% sulphur and remaining is ash. If 40% of excess air is used. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-114

S.E. (Mechanical/Automobile) (First 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 the term 'Atomic Packing Factor'? Calculate atomic packing factor for B.C.C unit cell, assuming the atoms to be hard spheres ? [4]

(*b*) Explain surface imperfections with *one* example. [2]

(*c*) What is ceramic material ? Explain its advantages and disadvantages with its applications. [6]

Or

2. (*a*) Differentiate between Isostress and Isostrain conditions of classifying composite materials. [4]

(*b*) What do you mean by the term 'Elastomers' ? [2]

P.T.O.

(c) What is work hardening ? Describe with a neat graph the stages of how it affects in mechanical properties ? [6]

3. (*a*) What is the significance of impact test ? Explain with any *one* type impact test. [5]

(*b*) What do you mean by magnetic particle test ? Differentiate between longitudinal and circular magnetization. [4]

(*c*) Explain Radiographic test with its advantages, disadvantages and applications. [4]

4. (*a*) Identify and explain the methods of NDT in the following applications : [6]

(*i*) Rods, bars, forging blanks and rough castings,

(*ii*) Surface detection of forgings, castings, weldments,

(*iii*) Detection of cracks in welding joints internal or external.

(*b*) Which is the material test for scratch hardness ? Explain in detail. [3]

(*c*) What is bauschinger's effect ? Explain with its root cause with example and neat sketch. [4]

5. (*a*) Define the term 'powder metallurgy'. What are the classifications of powder manufacturing processes ? [5]

(*b*) What do you mean by conditioning of metal powders ? Explain with purpose and different processing stages. [4]

(*c*) What is a diamond impregnated tool ? Explain the roll of powder metallurgy for manufacturing of diamond impregnated tool. [4]

Or

6. (*a*) Explain powder metallurgy with characteristics of metal powders, advantages, in the application of manufacturing the composite materials. [5]

(*b*) What do you mean by the term 'sintering' ? Explain the stages of sintering. [4]

(*c*) Powder metallurgical manufacturing is only beneficial for manufacturing for certain applications. Explain. [4]

7. (*a*) Explain the following terms (any *two*) : [4]

(*i*) Piezometric materials

(*ii*) Superconductors

(*iii*) Dielectric materials

(*b*) What do you mean by the term 'biomaterials' ? Explain with different types. [4]

(*c*) Explain 'Biosensors' with principle, advantages and applications . [4]

Or

8. (*a*) Explain the following terms (any *two*) : [4]

(*i*) Cryogenic applications of materials

(*ii*) Modern materials for high temperature applications

(*iii*) Soft and hard ferrites.

(*b*) Explain the concept of nanotechnology with *one* example. [4]

(*c*) Explain the concept of 'shape memory alloy' with advantages, disadvantages and applications. [4]

Total No. of Questions—**8**] [Total No. of Printed Pages—**5**

Seat No.	

[5152]-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**, 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.

1. (*a*) Distinguish between : [6]

(*i*) Newtonian and non-Newtonian fluids

(*ii*) Adhesion and Cohesion

(*iii*) Dynamic and Kinematic Viscosity.

(*b*) An equilateral triangular plate of 2 m side is immersed vertically in water with one of its axis of symmetry parallel to water surface and at a depth of 2 m below water surface. Determine total pressure and position of center of pressure. Neglect thickness of plate. [6]

P.T.O.

Or

2. (*a*) A metal disc of 500 mm diameter slides down an inclined plane covered with a thin film of oil of thickness 0.5 mm. The plane is inclined at 30° with horizontal. Viscosity of oil is 2.5 poise. If the speed of the disc is 0.5 m/s, determine its weight. [6]

(*b*) If velocity potential function is

$$\phi = c(x^2 - y^2),$$

where c is a numerical constant :

(*i*) Obtain corresponding stream function ψ

(*ii*) Show that flow is possible and irrotational

(*iii*) Sketch the streamlines. [6]

3. (*a*) State the governing principle of venturimeter and derive the equation for discharge through it. [6]

(*b*) Crude oil is pumped through a smooth horizontal pipe 1000 m long, 200 mm diameter. Kinematic viscosity of oil is 20 stokes. Flow rate of oil through pipe is 5300 N/min. The pipeline is laid at an upgrade of 1 : 100. The specific weight of oil is 8833 N/m^3. Assuming the flow of oil to be laminar, find the power required to pump the oil. [6]

Or

4. (*a*) Show that the velocity distribution of steady laminar flow between fixed parallel plates is parabolic. [6]

(*b*) A Pitot tube records a reading of 7.85 kN/m^2 as the stagnation pressure when it is held at the centre of a pipe of 250 mm diameter conveying water. The static pressure in the pipe is 40 mm of mercury (gauge). Calculate the discharge through the pipe assuming that the mean velocity of flow is 0.8 times the maximum velocity. Take C_d = 0.98. [6]

5. (*a*) The pressure drop through a diffuser depends on rate of flow, inlet area, exit area and fluid density. Obtain the relation between appropriate dimensionless parameters to describe the flow conditions. [6]

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

Or

6. (*a*) The losses $\frac{\Delta H}{l}$ per unit length of pipe in turbulent flow through a smooth pipe depends on velocity C, diameter D, gravity g, dynamic viscosity μ and mass density ρ. With dimensional analysis establish the following relation : [7]

$$\frac{\Delta H}{l} = f\left(\frac{\rho CD}{\mu}, \frac{C^2}{gD}\right).$$

(*b*) A farmer wishes to connect two pipes of different lengths and diameters to a common header supplied with 0.008 m^3/s of water from a pump. One pipe is 100 m long and 5 cm in diameter. The other pipe is 800 m long. Determine the diameter of other pipe such that both pipes have the same flow rate. Assume the pipes to be laid on ground level and friction coefficient for both pipes as 0.02. Also determine the head loss of water in the pipes. [6]

7. (*a*) Explain the following terms : [4]

(*i*) Skin friction drag

(*ii*) Induced drag.

(*b*) Define the following : [3]

(*i*) Chord length

(*ii*) Camber

(*iii*) Angle of attack.

(*c*) Explain the following terms : [6]

(*i*) Boundary layer thickness

(*ii*) Displacement thickness

(*iii*) Momentum thickness and

(*iv*) Energy thickness.

Or

8. (*a*) An automobile has a coefficient of drag of 0.3 before streamlining. The streamlining reduces the coefficient to 0.22. Find the percentage increase in the speed assuming the driving power to remain same. [7]

(*b*) Explain the following terms : [6]

(*i*) Laminar boundary layer

(*ii*) Turbulent boundary layer and

(*iii*) Laminar sublayer.

Total No. of Questions—**8**] [Total No. of Printed Pages—**5**

Seat No.	

[5152]-116

S.E. (Mech./Mech. Sand./Auto.) (II Sem.) EXAMINATION, 2017

THEORY OF MACHINES—I

(2012 COURSE)

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 indicate full marks.

(*iv*) Use of calculator is allowed.

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

1. (*a*) Define 'Inversion'. Explain with the help of neat sketches any *two* inversions of Four bar chain. [5]

(*b*) Write a note on 'Dynamically Equivalent System'. [5]

Or

2. (*a*) State the principle for correct steering and obtain the geometrical condition for correct steering of a car. [5]

(*b*) With the help of neat schematic diagram, derive frequency equation of Trifilar suspension system. [5]

P.T.O.

3. (*a*) Determine the inner radius of friction plate of single plate clutch and force required to engage the clutch, for the following specifications : [5]

(*i*) Power transmission capacity = 25 kW

(*ii*) Speed = 900 rpm

(*iii*) Outer diameter of plate is 360 mm

(*iv*) Maximum intensity of pressure between the plates = 85 kN/m^2.

(*v*) Coefficient of friction = 0.25.

Consider both the sides of the plate are effective.

Assume uniform wear condition.

(*b*) Explain Complex Algebra Method of acceleration analysis for a binary link. [5]

Or

4. (*a*) Describe with neat sketch the construction and working of Torsion dynamometer. [5]

(*b*) Derive an equation for velocity of piston in an I.C. engine mechanism, when crank rotates with uniform angular velocity using analytical method. [5]

5. (*a*) State and explain 'three centre's inline theorem'. [4]

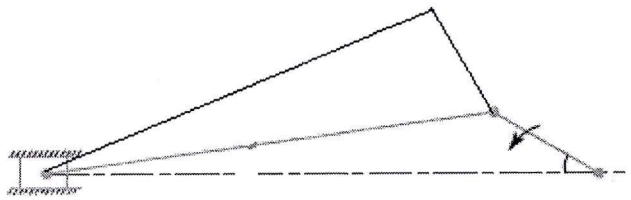
(*b*) In the mechanism shown in Fig. 1, the crank OA rotates at 180 rpm in anticlockwise direction and gives motion to the

sliding blocks B and point D. For the given configuration of mechanism, determine by relative velocity method and relative acceleration method : [11]

(*i*) Velocity of point D and slider B point

(*ii*) Angular velocity of link ABD

(*iii*) Acceleration of sliders B.



OA = 300 mm , AB =1.3 m , AD = 500, BD = 1.2 m

Fig. 1

Or,

6. (*a*) With the help of neat sketch, explain the concept of 'Velocity Image Principle'. [4]

(*b*) In the mechanism shown in Fig. 1 the crank OA rotates at 180 rpm in anticlockwise direction and give motion to the sliding block B and point D. For the given configuration of mechanism, locate all instantaneous centers of rotation and determine : [11]

(*i*) Velocity of point D and slider B

(*ii*) Magnitude and direction of angular velocity of link ABD.

7. (*a*) What is Coriolis acceleration ? Find the direction of this acceleration in the case shown in Fig. 2 : [4]

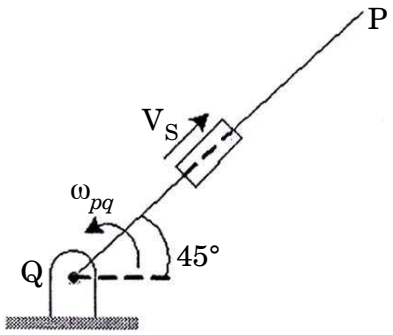


Fig. 2

(*b*) The crank of an engine is 200 mm long and obliquity ratio is 4. Determine the velocity and acceleration of the piston using Klein's construction, when the crank is turned through 40° from top dead centre position for the following two cases : [11]

(*i*) Crank rotates at a uniform speed of 300 rpm

(*ii*) Crank rotates at a speed of 300 rpm and is increasing at the rate of 120 rad/s^2.

Or

8. (*a*) Draw Klein's construction, and explain how to obtain velocity and acceleration of a piston in an I.C. engine mechanism, when crank rotates at a uniform angular velocity. [4]

(*b*) In the mechanism shown, link 4 moves to the left with a velocity of 80 mm/s and with acceleration is 80 mm/s^2 to the left. Draw the velocity and acceleration polygons and obtain angular velocity and angular acceleration of link 2. Link length AB = 50 mm, fixed link is link no. 1 : [11]

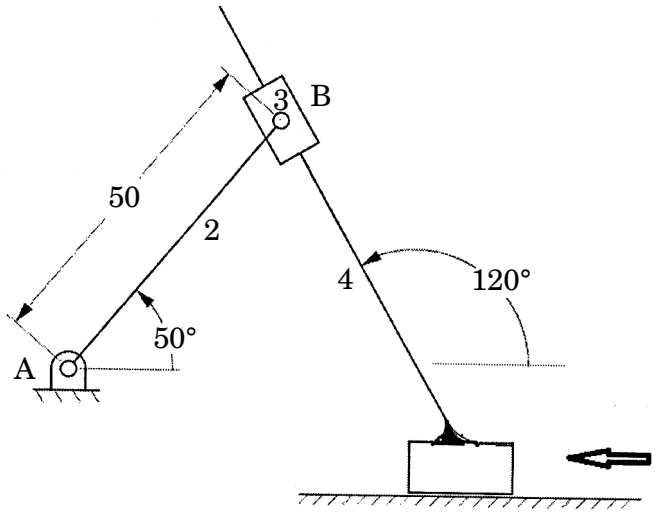


Fig. 3

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

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[5152]-117

S.E. (Mechanical/Automobile) EXAMINATION, 2017

ENGINEERING METALLURGY

(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 neat, well labelled sketch wherever if necessary.

1. (*a*) Draw a neat, well labelled schematic TTT curve for medium carbon steel. [4]

(*b*) What is meant by alloy steel ? State different types of stainless steel, and give composition of 304SS. [4]

(*c*) Explain different steel specifications, with suitable example. [5]

Or

2. (*a*) Differentiate between Microscopic and Macroscopic examination. [4]

(*b*) Define etching, and state etching reagents for ferrous and non-ferrous metals. [4]

(*c*) Draw iron-iron carbide equilibrium diagram, showing all details. [5]

P.T.O.

3. (*a*) Draw a schematic diagram showing all details of Metallurgical microscope. [4]

(*b*) State the importance of hardenability of steel, it depends on which factors ? [4]

(*c*) Explain mechanism of corrosion with suitable figure. [4]

Or

4. (*a*) Classify surface hardening treatments, and explain induction hardening. [4]

(*b*) Explain crevice corrosion method. How can it be prevented ? [4]

(*c*) What is inter-granular corrosion ? Explain with figure. [4]

5. (*a*) What is 'malleabilising' heat treatment ? To which type of cast iron is it given ? [4]

(*b*) Differentiate between White cast iron and Nodular cast iron. [4]

(*c*) Explain how modification in design will improve corrosion resistance ? [5]

Or

6. (*a*) Draw the microstructure of Nodular cast iron and state two applications of it. [4]

(*b*) Why is Grey cast iron found commonly in columns but not in structural beams ? [4]

(*c*) What is meant by 'inoculation' in context of cast irons ? Why is it done ? [5]

7. (*a*) Write a short note on bearing materials. State any *two* materials. [4]

(*b*) Draw a necessary phase diagram for brass, showing all phases. [4]

(*c*) Why is aluminium called as corrosion resistance metal ? [4]

Or

8. (*a*) Differentiate between brass and bronze. [4]

(*b*) Explain the heat treatment given in case of aluminium alloys. [4]

(*c*) Write a short note on double tempering. Where is it needed ? [4]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-118

S.E. (II Sem.) (Automobile/Mechanical Engineering)

EXAMINATION, 2017

APPLIED THERMODYNAMICS

(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** *or* 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 attached extra supplements if required.

(*iii*) Draw neat and labelled diagram wherever necessary.

(*iv*) Use of steam tables, Mollier charts and scientifc calculator is allowed.

(*v*) Assume suitable data wherever necessary.

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

1. (*a*) Draw valve timing diagram for four-stroke low and high speed diesel engine. [6]

(*b*) Explain with sketch the working principle of simple carburetor. [6]

Or

2. (*a*) Draw valve timing diagram for two-stroke low and high speed petrol engine. [6]

(*b*) Why are compensating devices necessary for simple carburetor ? Explain any *one* of them. [6]

P.T.O.

3. (*a*) Discuss the effect of the following engine variables on delay period in CI engine : [6]

(*i*) Intake Temperature

(*ii*) Compression ratio

(*iii*) Engine load

(*b*) During a test on the four cylinder, four-stroke oil engine the following data were recorded : [7]

Bore = 10 cm

Stroke = 12 cm

Speed = 1200 RPM

Break Torque = 120 Nm

Fuel consumption = 5 kg/hr

C.V. of fuel = 42 MJ/kg

Ambient Temperature = 17°C

Ambient Pressure = 1 bar.

Calculate :

(*i*) The thermal efficiency on break power basis.

(*ii*) The break mean effective pressure.

Or

4. (*a*) Explain the phenomena of diesel knock. Compare it with the phenomena of detonation in SI engines. [6]

(*b*) Find the air-fuel ratio of a 4-stroke, 1 cylinder, air cooled engine with fuel consumption time for 10 cc as 20.0 sec. and air consumption time for 0.1 m^3 as 16.3 sec. The load is 16 kg at speed of 3000 rpm. Also find brake specific fuel consumption in g/kWh and thermal brake efficiency. Assume the density of air as 1.175 kg/m^3 and specific gravity of fuel to be 0.7. The lower heating value of fuel is 44 MJ/kg and the dynamometer constant is 5000. [7]

5. (*a*) Write a short note on capacitor discharge ignition (CDI) system. [6]

(*b*) Enlist at least six harmful effects of emission due to IC engines. [6]

Or

6. (*a*) Write a short note on water cooling system for IC engine. [6]

(*b*) Write a short note on Bharat stage-IV norms. [6]

7. (*a*) Define the following terms in relation with reciprocating compressor : [6]

(*i*) Isothermal efficiency

(*ii*) Free air delivery

(*iii*) Volumetric efficiency.

(*b*) A single stage single acting reciprocating air compressor has air entering at 1 bar, 20°C and compression occurs following polytropic process with index 1.2 up to the delivery pressure of 12 bar. The compressor runs at the speed of 240 rpm and has L/D ratio of 1.8. The compressor has mechanical efficiency of 0.88. Determine the isothermal efficiency and cylinder dimensions. [7]

Or

8. (*a*) Enlist advantages of rotary compressors over reciprocating compressors. [6]

(*b*) A reciprocating air compressor has four-stage compressions with 2 m^3/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]

Total No. of Questions—**8**] [Total No. of Printed Pages—**7**

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[5152]-119

S.E. (Mechanical/Mechanical-SW/Automobile)

EXAMINATION, 2017

STRENGTH OF MATERIALS

(2012 COURSE)

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*) All the *four* questions should be solved in one answer book and attach the extra supplements if required.

(*iii*) Neat diagrams must be drawn wherever necessary.

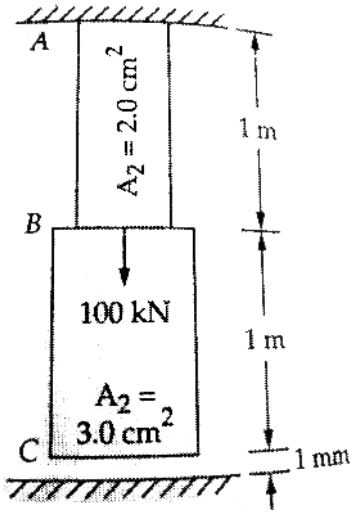
(*iv*) Figures to the right indicate full marks.

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

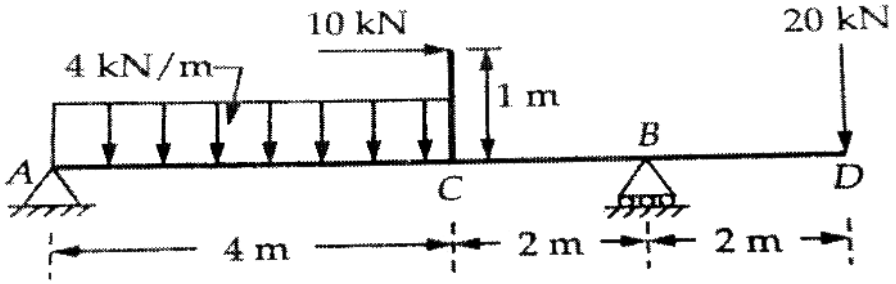
1. (A) A bar ABC shown in figure consist of two parts, AB and BC, each part being 1 m long and having cross-sectional areas 2 cm^2 and 3 cm^2 respectively. The bar is suspended from A and there is a rigid horizontal support at 2.001 m from A. A force of 100 kN acting vertically downwards is applied at

P.T.O.

B. Determine the stresses in parts AB and BC of the bar. Take E = 200 GN/m^2. [6]

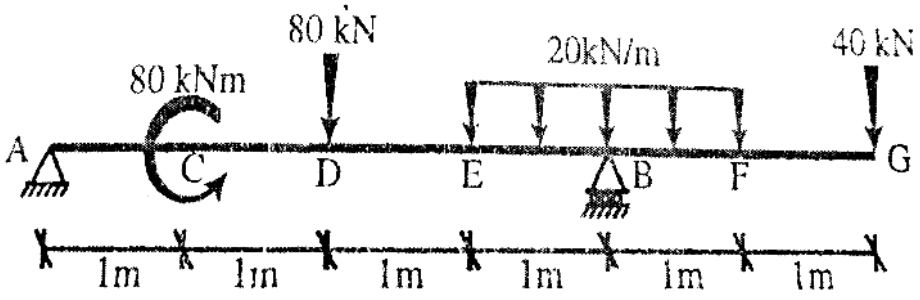


(B) Draw SFD and BMD for the beam shown in the following figure. Also locate the points of contraflexure if any. [6]



Or

2. (A) The beam is supported and loaded as shown in figure. Draw SFD and BMD indicating all important values. [6]

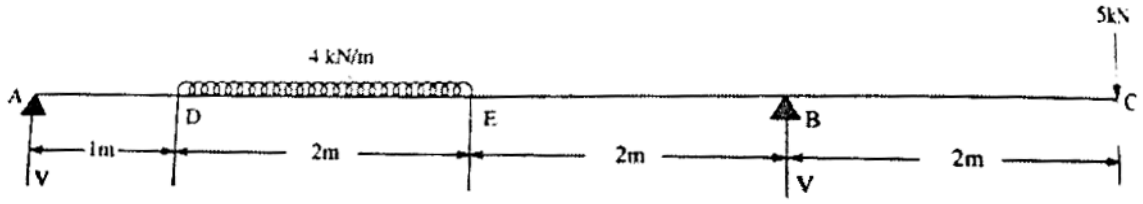


(B) A bar of steel is 40 mm × 40 mm in cross-section and it is 120 mm long. It is subjected to a tensile of 200 kN along the longitudinal axis and tensile loads of 500 kN & 400 kN on the lateral faces.

(*i*) Find change in dimensions of the bar and change in volume.

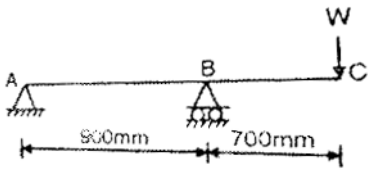
(*ii*) Find also what axial longitudinal tensile load acting alone can produce the same longitudinal strain as above case. Take E = 2 × 10^5 N/mm^2, μ = 0.3. [6]

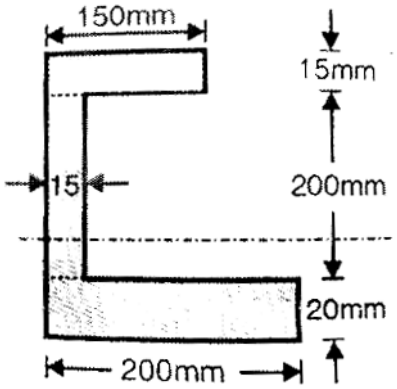
3. (A) For the loaded beam shown in figure. Find the deflection at free end and the maximum deflection between the supports. Take E = 200 kN/mm^2 and I = 9 × 10^6 mm^4. [6]



(B) A simply supported overhang is loaded with point load as shown in figure. A CI beam of C section with top flange 150 mm × 15 mm, bottom flange 200 mm × 20 mm and web 15 mm × 200 mm. The allowable stresses in tension and com-

pression are 120 MPa and 90 MPa. Find the safe value of load 'W' on the overhang. [6]





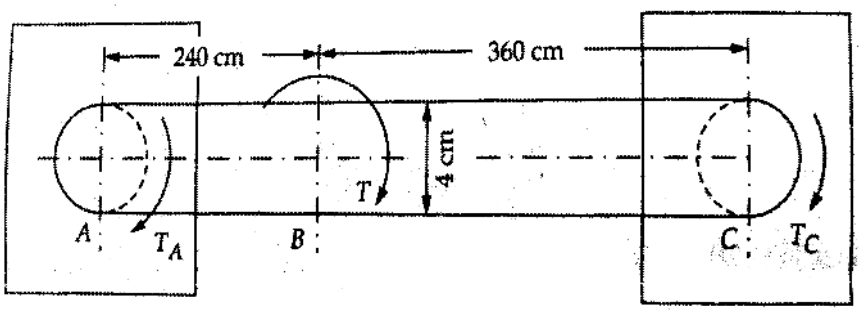
Or

4. (A) A vertical steel rod, 2 m long is fixed at its upper end and a weight sliding freely on the rod falls on the collar fixed firmly at its end. When the weight falls through a height of 15 mm, the maximum stress 60 MPa. What will be the maximum instantaneous stress developed if the same weight had been dropped through height of 25 mm ? E = 210 GPa. [6]

(B) A symmetrical beam of I-section is 200 mm × 400 mm in size, the thickness of flange 20 mm and web is 15 mm. The beam carrying UDL of 25 kN/m over entire length of 5 m. Draw the shear stress distribution diagram over depth of section. Also find the ratio of maximum shear stress to average shear stress. [6]

5. (A) Find Euler's critical load for a hollow cylindrical steel column of 40 mm external diameter and 3 mm thick. Take length of column is 3 m and hinged at its both ends. Also determine crippling load by Rankine's formula. Take α = 1/7500, E = 205 kN/mm^2 and σ_c = 335 N/mm^2. For what length of column would critical load by Euler's and Rankine's formula be equal ? [7]

(B) A 600 cm long solid shaft is fixed at both ends. A torque of 75 kN cm is applied to the shaft at a section of 240 cm from one end. What are the fixing torques set up at the ends of the shaft ? If the diameter of the shaft is 4 cm, calculate the maximum stress developed in the two portions. Also find the angle of twist at the point where the torque is applied. Take G = 75 kN/cm^2. [6]



Or

6. (A) Determine the ratio of the buckling strengths of a solid steel column to that of a hollow column of same material and having same cross-sectional area. The internal diameter of hollow column is half of its external diameter. Both the columns are of the same length and are pinned at both ends. [7]

(B) A hollow shaft of diameter ratio 3/5 is required to transmit 482 KW at 125 rpm. The shearing stress in the shaft must snot to exceed 65 N/mm^2 and the twist in a length of 2 m not to exceed 1 degree. Calculate minimum external diameter of shaft which would satisfy these conditions. Take G = 8×10^4 N/mm^2. [6]

7. (A) A bolt is subjected to an axial pull of 12 kN and a transverse shear force of 5 kN. Determine the diameter of the bolt required based on : [6]

(*i*) Maximum principal stress theory

(*ii*) Maximum distortion energy theory.

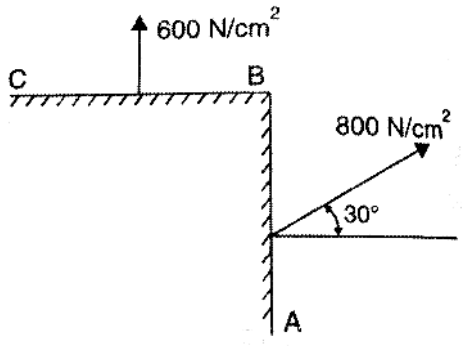
Take elastic limit in simple tension is equal to 270 MPa and Poisson's ratio = 0.3. Adopt F.O.S. = 3.

(B) The intensity of resultant stress on a plane AB as shown in figure at a point in a material under stress in 800 N/cm^2 and it is inclined at 30^0 on the normal to that plane. The normal component of stress on another plane BC at right angles to plane AB is 600 N/cm^2. Determine : [7]

(*i*) the resultant stress on the plane BC,

(*ii*) the principal stresses and their directions and

(*iii*) the maximum shear stress.



Or

8. (A) A solid circular shaft is subjected to a bending moment of 8 kNm and a torque of 12 kNm. In a uniaxial test the shaft material gave the following results : Modulus of elasticity = 200 GN/m^2, Stress at yield point = 300 N/mm^2, Poisson's ratio = 0.3, Factor of safety = 3. Estimate the least diameter of the shaft using : [6]

(*i*) Maximum shear stress theory

(*ii*) Shear strain energy theory.

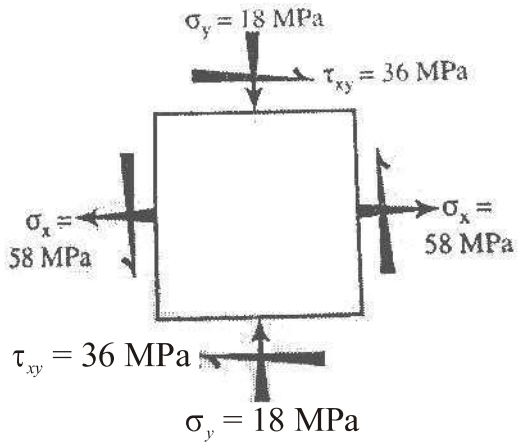
(B) At a point in a strained material, two-dimensional state of stress is as shown in figure. Determine graphically : [7]

(*i*) Principal stresses

(*ii*) Principal planes

(*iii*) Maximum shear stress

(*iv*) Normal and shear stress component on planes whose normals are at 35° and 125° with *x*-axis.



Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

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S.E. (Mechanical, Mech. Sandwich and Automobile) (II Sem.)

EXAMINATION, 2017

ELECTRONICS AND ELECTRICAL ENGINEERING

(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*) Assume suitable data, if necessary.

1. (*a*) Write important features of architecture of 8051 micro-controller. [6]

(*b*) Explain TMOD register along with operating modes provided by it. [6]

Or

2. (*a*) Explain asynchronous and synchronous data transfer formats. [6]

(*b*) Explain addressing modes supported by 8051 microcontroller; quoting *one* example each. [6]

3. (*a*) Obtain generalized expression for torque in a dc motor with usual notations. What is lost torque ? [6]

P.T.O.

(*b*) The useful full load torque of 3-phase, 6-pole, 50 Hz induction motor is 162.84 N-m. The rotor emf is observed to make 90 cycles per minute. Calculate : [7]

(*i*) motor output

(*ii*) rotor copper loss

(*iii*) motor input and

(*iv*) efficiency if mechanical torque lost in windage and friction is 20.36 N-m and stator losses are 830 W.

Or

4. (*a*) Draw and explain the torque -slip characteristics of an induction motor. [6]

(*b*) A dc series motor drives a load : the torque of which varies as the square of the speed. The motor takes a current of 15A when the speed is 600 rpm. Calculate the speed and the current when the motor field winding is shunted by a diverter of the same resistance as that of the field winding. The armature and field voltage drops are negligible. [7]

5. (*a*) What are advantages of digital voltmeters over analog voltmeters ? State limitations of digital voltmeters. [6]

(*b*) Explain the working of Cathode Ray Oscilloscope (CRO) with the help of block diagram. [6]

Or

6. (*a*) Explain the working of digital frequency counter with the help of block diagram. [6]

(*b*) Discuss measurement of voltage, current and phase by using Cathode Ray Oscilloscope (CRO). [6]

7. (*a*) Discuss the working of Maxwell's Bridge for measurement of unknown inductance. [6]

(*b*) Draw the connection diagram for two wattmeter method used to measure active power in a three-phase circuit.

In an industrial application, the total power is 100 kW and power factor is 0.66 leading for a certain load. Calculate the reading of each wattmeter. For what power factor will one of the wattmeters read zero ? [7]

Or

8. (*a*) Discuss one wattmeter method for measurement of reactive power with the help of connection diagram and phasor diagram. [6]

(*b*) Explain the use of Sphere Gaps for measurement of peak value of high voltages. State merits and demerits offered by this method. Mention precautions to be taken while working with Sphere Gaps. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-121

S.E. (Mechanical Sandwich) (First Sem.) EXAMINATION, 2017

MATERIAL SCIENCE AND METALLURGY

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Answer any *four* questions : **1** or **2**, **3** or **4**, **5** or **6** and **7** or **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Use of electronic pocket calculator is allowed.

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

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

1. (*a*) What are linear defects in crystalline materials ? Explain any *one* with sketch. [4]

(*b*) What is effect of grain size on the strength of materials ? [4]

(*c*) Define "hardness". Explain Rockwell Hardness test. Which are the factors affecting the hardness ? [4]

Or

2. (*a*) Explain in brief Dye Penetration Test. [4]

(*b*) What is "stress assisted corrosion" ? How can it be reduced ? [4]

(*c*) Explain in brief the effect of temperature on impact resistance of the material. [4]

P.T.O.

3. (*a*) Differentiate between steels and cast irons. Which *one* has more tensile strength ? Why ? [4]

(*b*) Draw microstructure of a slowly cooled high carbon steel. What are its properties and applications ? [4]

(*c*) Explain in brief "Case Carbonizing" heat treatment. [4]

Or

4. (*a*) What are the steps involved in "Full annealing" of a steel ? Explain in brief the properties of annealed steel. [4]

(*b*) What are stainless steels ? What are their properties and applications ? [4]

(*c*) What is the role of Tungsten, Molybdenum *or* Vanadium in alloy steels ? [4]

5. (*a*) Explain in brief "conditioning of metal powders". [4]

(*b*) What are "cermets" ? What are their properties and applications ? [4]

(*c*) Draw phase equilibrium diagram of Copper-Nickel alloy. Explain the effect of Nickel percentage on mechanical properties. [5]

Or

6. (*a*) What are the advantages of powder metallurgy products ? [4]

(*b*) Explain in brief "season cracking" of brass. [4]

(*c*) What is the effect of percentage silicon in Aluminium alloy on the mechanical properties of the alloy ? [5]

7. (*a*) What are metal matrix composites ? What are their properties and applications ? [4]

(*b*) Differentiate between thermoset and thermoplast polymers. [4]

(*c*) Classify the "ceramics" and give applications of different classes of ceramic materials [5]

Or

8. (*a*) Explain welding process for joining two metal components. [4]

(*b*) Differentiate between fragmented continuous fibre reinforced composites. [4]

(*c*) What is "Nitriding" ? Why is it preferred to alloy steels ? [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-122

S.E. (Mechanical Sandwich) (First Semester)

EXAMINATION, 2017

FLUID MECHANICS AND MACHINERY

(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*) Answers should be written in same answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

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

(*v*) Your answers will be valued 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.

1. (*a*) The velocity distribution of fluid flow over plate is given by :

$$u = 4y - y^2 \text{ for } y \leq 2 \text{ m}$$

where, u is the velocity in m/s at a distance 'y' meter above plate. If the coefficient of dynamic viscosity is 1.5 Pa-s. Determine the shear stress at $y = 0$ and at $y = 2$. [6]

(*b*) Define and explain : [6]

(*i*) Buoyancy

(*ii*) Metacentric height.

P.T.O.

Or

2. (*a*) With usual notations prove that : BM = I/V. [8]

Where, B = Centre of Buoyancy

M = Metacentric of height

I = Moment of inertia of cross-sectional area

V = Volume of liquid displaced.

(*b*) Define Centre of Pressure and Total Pressure. [4]

3. (*a*) Obtain the expression for the force exerted by a jet of water on a stationary curved plate striking the jet at centre. [5]

(*b*) The vertical pipe 2 m long has 200 mm diameter at the lower end, 400 mm diameter at upper end. It carries water of 200 lps. If loss in pipe is 1 m of water. Find pressure difference in N/m^2 between two ends of pipe. Also find velocities at upper and lower ends of pipe. [8]

Or

4. (*a*) Two pipes running parallel, are joined end to end. The total discharge to be carried by the system is 2000 lit/sec. Determine the discharge carried by each pipe. Particular of pipe are as follows : [7]

Pipe	**Friction Factor**	**Diameter (m)**	**Length (m)**
A	0.018	0.60	1000
B	0.020	0.80	800

(*b*) Define and explain hydraulic efficiency, mechanical efficiency and overall efficiency of a turbine. [6]

5. (*a*) Using Buckingham's π-theorem, show that the shear stress of the pipe wall given by : [7]

$$\tau_0 = \rho V^2 f\left(\frac{\rho V d}{\mu}\right).$$

Where, V = Average velocity, ρ = density, μ = viscosity, d = Pipe diameter.

(*b*) Derive an expression for the power transmission through the pipes. Find also the condition for maximum transmission of power. [6]

Or

6. (*a*) A Pelton wheel has a mean bucket speed of 10 m/s with a jet of water flowing at the rate of 700 lps under a head of 30 m. The bucket deflects the jet through an angle of 160°. Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity as 0.98. [8]

(*b*) Describe briefly the functions of various main components of Pelton turbine with neat sketch. [5]

7. (*a*) Centrifugal pump is to discharge 0.118 m^3/s at a speed of 1450 rpm against a head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and Manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. [6]

(*b*) Describe multistage pump with : [6]

(*i*) Impellers in parallel, and

(*ii*) Impellers in series.

Or

8. (*a*) The diameters of an impeller of a centrifugal pump at inlet and outlet are 30 cm and 60 cm respectively. Determine the minimum starting speed of the pump if it works against a head of 30 m. [6]

(*b*) What is cavitation and what are its causes ? How will you prevent the cavitation in hydraulic machines ? [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[5152]-123

S.E. (Mechanical Sandwich) (Second Semester)

EXAMINATION, 2017

METROLOGY AND QUALITY CONTROL

(2012 Course)

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. **1** *or* Q. **2**, Q. **3** *or* Q. **4**, Q. **5** *or* Q, **6**, Q. **7** *or* Q. **8**)

(*iii*) Assume suitable data if necessary.

(*iv*) Use of calculator is allowed.

(*v*) Figures to the right side indicate full marks.

1. (*a*) Explain with suitable example how to check taper angle of taper plug gauge. [6]

(*b*) What are the types of interferometer. Explain any *one*. [6]

Or

2. (*a*) Explain advantages and limitations for comparators. [6]

(*b*) Describe with neat sketch any *one* contact type surface measuring instrument. [6]

3. (*a*) How to check the internal and external thread parameters ? List down the methods and explain any one. [6]

(*b*) Explain Juran's Trilogy approach. [6]

Or

4. (*a*) Write a short on Ishikawa diagram and Pareto Analysis. [6]

(*b*) Explain role of advance metrology in manufacturing. [6]

5. (*a*) What is Six Sigma ? Explain the concept of process capability. [7]

(*b*) Explain five S in detail. [6]

Or

6. (*a*) Write short notes on (any *two*) : [8]

1. FMECA
2. JIT
3. Kanban

(*b*) Explain different pillars of TPM [5]

7. (*a*) State different types of variable and attribute control charts. Explain any *one*. [5]

(*b*) Construct a *p* control chart for the data provided considering sample size 130 : [8]

Sample Number	1	2	3	4	5	6	7	8	9	10	11	12
Number of Defective	4	3	3	5	6	5	2	3	5	6	6	5

Comment on the control chart.

Or

8. (*a*) Find the probability of acceptance and rejection for the given data; lot size 3000, sample size 89, maximum number of defects accepted in a sample is 2 and the percentage of defective parts in a lot is 0.2%. If 120 lots have to be inspected how many lots will be rejected ? Also find the number of defective parts in a lot [8]

(*b*) What is PPAP ? Explain its applications [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-124

S.E. (Mech/SW) (II Sem.) EXAMINATION, 2017

MANUFACTURING ENGINEERING

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

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.

1. (*a*) Explain various types of patterns with neat sketch. List out materials used for pattern. [6]

(*b*) Explain principle of resistance welding. What are the types and applications. [6]

Or

2. (*a*) What is extrusion ? How does direct extrusion differ from indirect extrusion ? [6]

(*b*) Describe various welding defects and remedies to overcome. [6]

3. (*a*) Sketch and explain the following : [6]
(*i*) Counterboring
(*ii*) Countersinking
(*iii*) Spot facing.

P.T.O.

(*b*) Explain Up and Down Milling Operation with neat sketch. [6]

Or

4. (*a*) Draw neat sketch and explain ultrasonic machining. [6]

(*b*) Define taper turning. Explain different methods of taper turning on centre lathe with simple sketches. [6]

5. (*a*) Describe and draw the neat sketch of Progressive die and Combination die. [6]

(*b*) What is stripper ? Why is stripper required ? Explain different types of strippers with neat sketches. [7]

Or

6. (*a*) Explain working principle of Shearing and Blanking operations with neat sketches. [6]

(*b*) Find the total pressure, dimensions of tools to produce a washer 5 cm. Outside diameter with 2.5 cm diameter hole, from material 4 mm thick, having a shear strength of 360 N/mm^2. Assume clearance as 10% of stock thickness. [7]

7. (*a*) Explain any *two* types of locators and clampers. [6]

(*b*) List out various types of jig and fixtures. Explain any *one* with neat sketches of jig and fixture. [7]

Or

8. (*a*) Explain with figure the restricted motions of workpiece by 3-2-1 Principle of Location. [6]

(*b*) What is indexing in jig and fixtures ? Explain *one* method of indexing. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-125

S.E. (Mechanical Sandwich) 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.

1. (*a*) Derive an expression for the volumetric efficiency of a reciprocating compressor in terms of clearance ratio, pressure ratio and index of compression. [6]

(*b*) Draw P-h and T-s diagrams of vapour compression refrigeration system and explain the effect of superheating and sub-cooling on COP of it. [6]

Or

2. (*a*) In a three stage compressor, air is compressed from 98 kPa to 2000 kPa. Calculate for 1 m^3 of air per second : [6]

(*i*) Work under ideal condition for n = 1.3

(*ii*) Isothermal work

(*iii*) Isothermal efficiency.

P.T.O.

(*b*) Describe with a neat sketch the operation of an air refrigeration system working on Bell Coleman cycle. [6]

3. (*a*) Explain the following : [6]

(*i*) Factors affecting human comfort

(*ii*) Application of air conditioning.

(*b*) Compare battery ignition system and magneto-ignition system. [6]

Or

4. (*a*) Define the following terms : [6]

(*i*) Dry bulb temperature

(*ii*) Wet bulb temperature

(*iii*) Dew point temperature

(*iv*) Relative humidity

(*v*) Specific humidity

(*vi*) Partial pressure of vapour.

(*b*) What are various methods of turbocharging ? Compare their relative merits. [6]

5. (*a*) Explain phenomenon of diesel knock. Compare it with the phenomenon of detonation in S.I. engines. [6]

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

Or

6. (*a*) Explain stages of combustion in. S.I. engine. [6]

(*b*) Write short notes on : [7]

(*i*) Ignition delay and factors affecting delay period

(*ii*) Emissions from S.I. and C.I. engines and their harmful effects.

7. (*a*) 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 plant when the air enters the compressor at 15°C at the rate of 16 kg/s. The properties of gas may be assumed to be the same as that of air. Show the schematic diagram of the plant and represent the processes on T-S diagram. [6]

(*b*) What are the different methods used to improve efficiency of a gas turbine plant ? Explain any *one* method with a neat sketch. [7]

Or

8. (*a*) Write the merits and demerits of gas turbine plant over internal combustion engines. [6]

(*b*) Explain the workings of a Ramjet engine with the help of a sketch. What are its applications ? [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-132

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

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Attempt Q. No. **1** or **2**, Q. No. **3** or **4**, Q. No. **5** or **6**, Q. No. **7** or **8.**

(*ii*) Neat diagram must be drawn wherever necessary.

(*iii*) Figures to right indicate full marks.

(*iv*) Use of Scientific calculator is allowed.

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

1. (A) What is thermal runaway ? How to overcome thermal runaway in BJT ? [6]

(B) Determine, A_v, R_i, R_o for the circuit as shown in fig.(1). Assume h_{fe} = 100 h_{ie} = 1.1 kΩ h_{re} = h_{oe} = 0, R_1 = 10 kΩ, R_2 = 1 kΩ R_C = 1 kΩ, R_E = 500Ω, C_1 = C_2 = 10μF, C_E = 100 μF and V_{CC} = 10 V. [6]

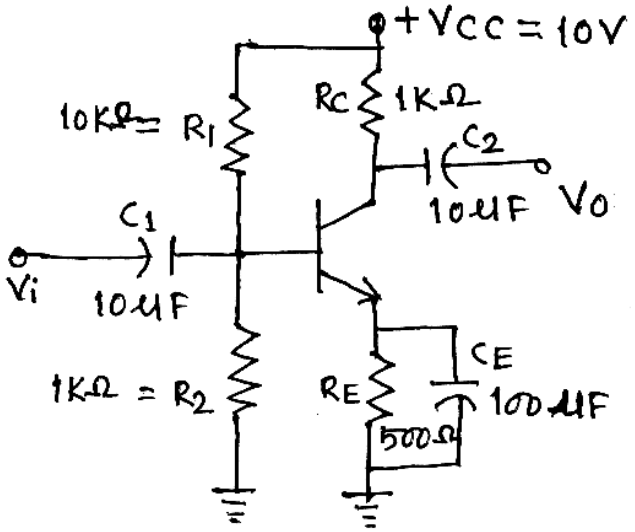


Fig. 1

P.T.O.

Or

2. (A) Compare CE, CB and C.C. BJT configurations based on A_v, A_i, R_i and R_o. [6]

(B) Determine d.c. operating point parameters for the circuit as shown in Fig. (2). Assume V_{BE} = 0.7 V, I_{CEO} = 0, β_{dc} = 100. [6]

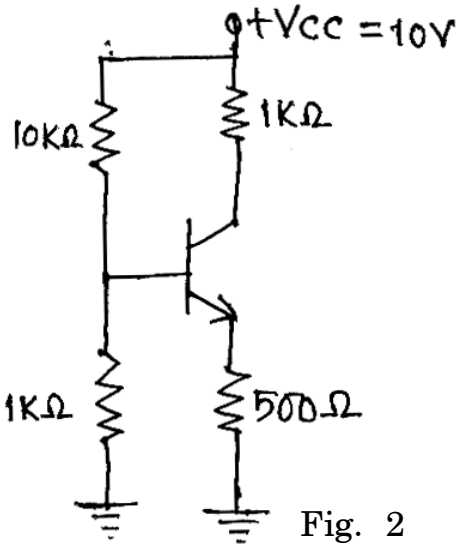


Fig. 2

3. (A) Plot the frequency response curve for C.E. amplifier and explain the effect of various capacitances on the cut-off frequencies. [6]

(B) Draw any one LC oscillator circuit and explain its working by stating its formula for frequency of oscillation. [6]

Or

4. (A) A step response of an amplifier is an shown in the figure (3) at 1 kHz. Calculate f_L, f_H and BW for V_0= 2.5V V_0' = 1V, t_r = 20 μs. [6]

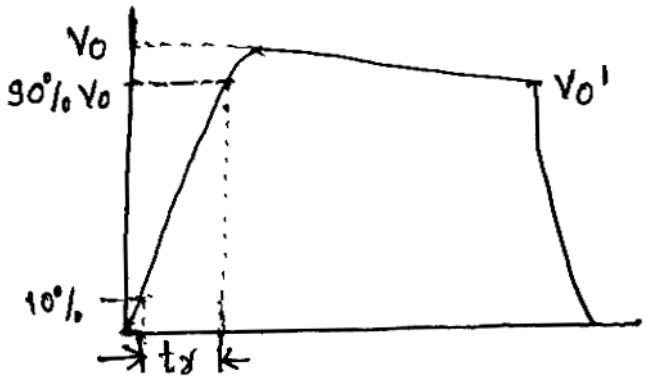


Fig. 3

(B) Compare various feedback amplifiers on the basis of R_i, R_o and gain. [6]

5. (A) Classify large signal amplifiers on the basis of 2 point, collector efficiency and distortions. [6]

(B) Draw and explain complementary symmetry push-pull amplifier with neat waveforms. [7]

Or

6. (A) In a power amplifier reading for distortions are $D_2 = 0.14$, $D_3 = 0.005$ and $D_4 = 0.003$ with $I_1 = 3.1$ A for $R_C = R_L = 4\Omega$. Then calculate (*i*) THD (*ii*) fundamental power component & (*iii*) total power. [6]

(B) For a series fed class–A amplifier as shown in Fig. (4)

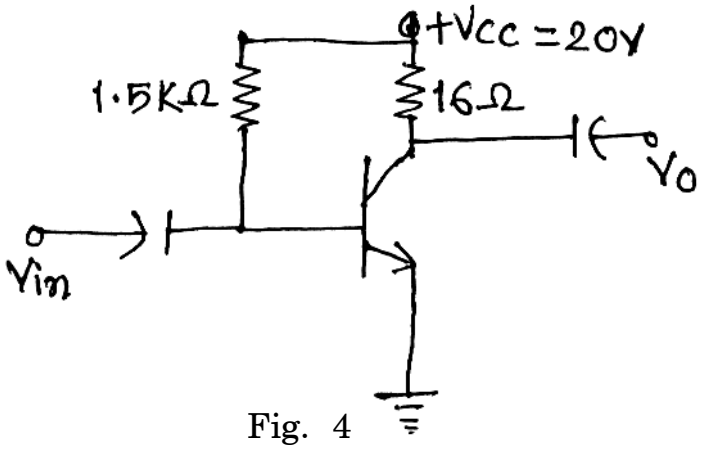


Fig. 4

Calculate d.c. power, a.c power and efficiency.

Given $V_{CC} = 20$ Volt, $I_{CQ} = 643.5$ mA and V_o(p-p) = 18 Volt.

7. (A) Draw the constructional diagram of N-channel E-MOSFET and explain with transfer and drain or O/P characteristics. [8]

(B) Explain Bi-CMOS with suitable circuit diagram.

Also state its advantages. [5]

Or

8. (A) Explain any *two* non-ideal effects in E-MOSFET with suitable diagrams or characteristic curves. [4]

(B) Draw small signal a.c. equivalent model of common source configured *n*-channel E-MOSFET. [3]

(C) Determine A_v, R_i, R_o for the C.S. amplifier as shown in Fig. (5). Given parameters for E-MOSFET are g_m = 1.41 mA/V, V_{Th} = 1.5V and K = 0.5 mA/V^2. [6]

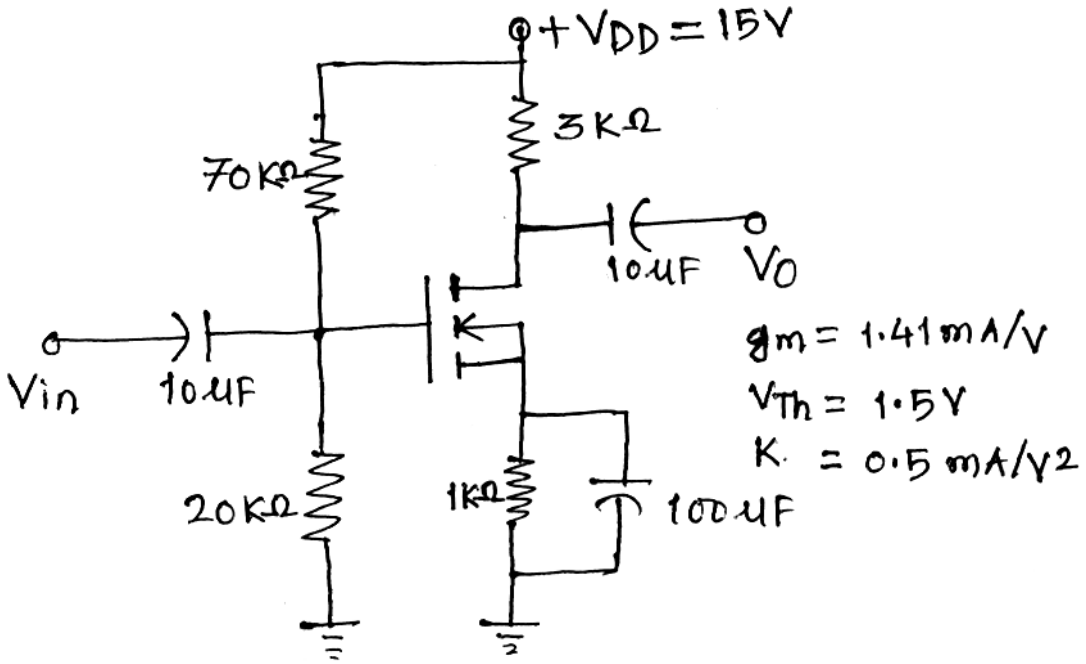


Fig. 5

Total No. of Questions—**8**] [Total No. of Printed Pages—**6**

Seat No.	

[5152]-133

S.E. (E&TC/Electronics) (I Sem.) EXAMINATION, 2017

NETWORK THEORY

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

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

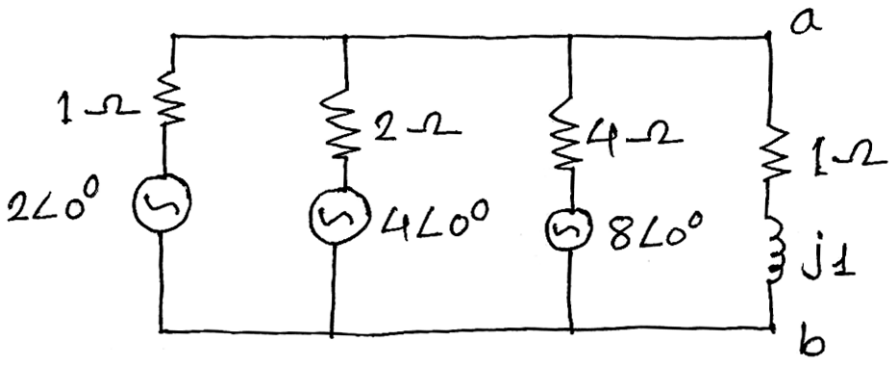
(*ii*) Figures to the right indicate full marks.

(*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.

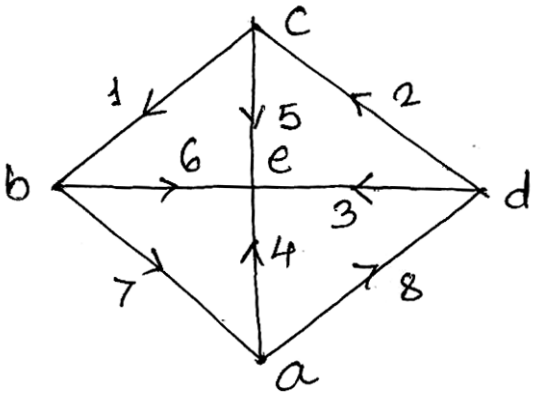
(*v*) Assume suitable data, if necessary.

1. (*a*) Find the current passing through the impedance (1 + *j*1) in the circuit shown below, using Nortons theorem. [6]



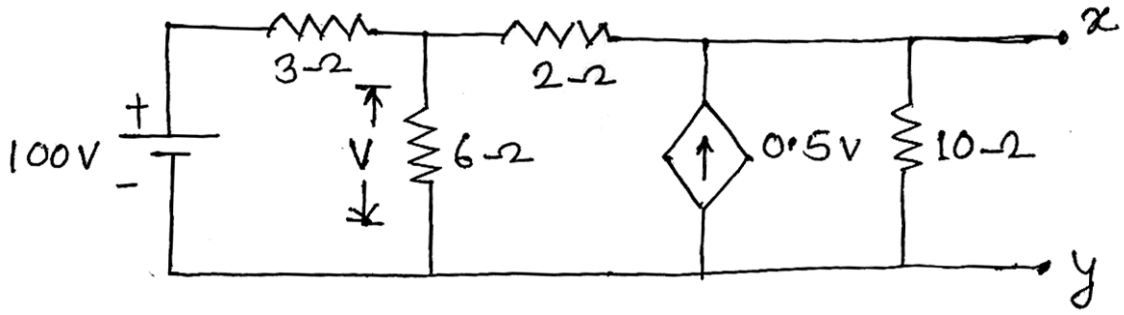
P.T.O.

(*b*) What is meant by oriented graph ? Find the voltage drop equations for the oriented graph shown below. [6]



Or

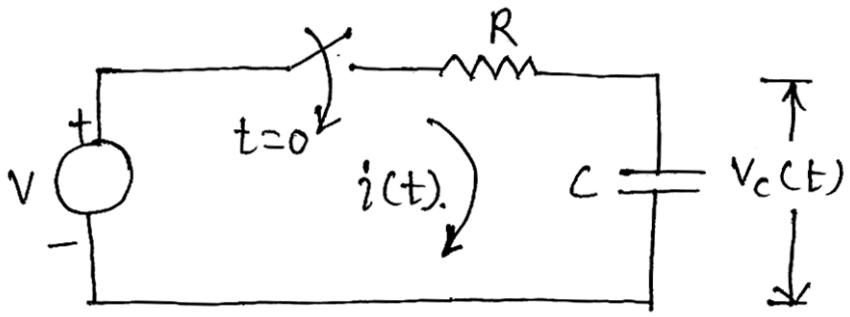
2. (*a*) State Norton's theorem and find the Norton's equivalant circuit at the terminals *xy* of the circuit shown below. [6]



(*b*) Explain the tree with example and determine the possible numbers of tree of a incidence matrix [A] of a graph is given by : [6]

$$[A] = \begin{bmatrix} -1 & 0 & 0 & 1 \\ 1 & -1 & 1 & 0 \\ 0 & 1 & -1 & -1 \end{bmatrix}_{3\times 4}$$

3. (*a*) Derive the expression for voltage across the capacitor and current flowing through it of circuit shown below : [6]



(*b*) For a parallel rersonant circuit, find :

(*i*) Specify the value of the circuit capacitor

(*ii*) Resistance of the circuit at parallel resonance

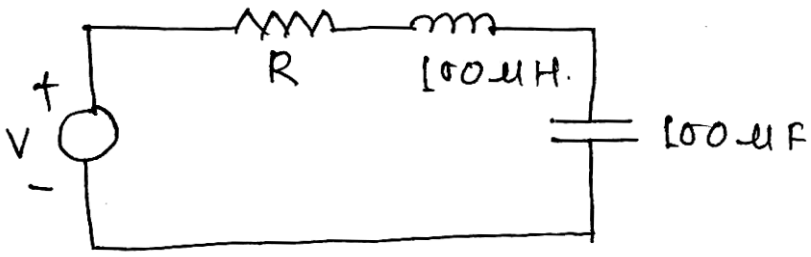
(*iii*) What is the absolute bandwidth of the resonant circuit ?

(*iv*) The bandwidth of the circuit, when it is matched with the generator impedance.

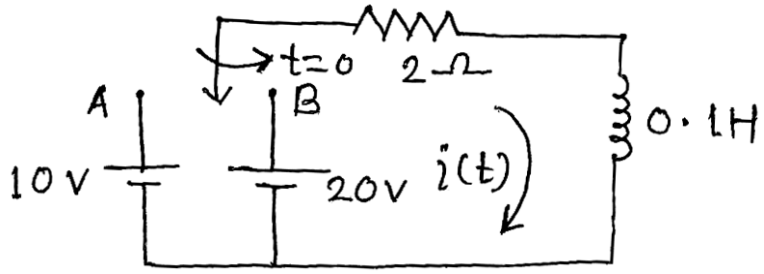
When Q = 75, L = 120 μH and resonating frequency of 1 MHz. [6]

Or

4. (*a*) The series resonant circuit has a lagging phase angle of 30° at ω_H = 12000 rad/sec. at what frequency will be leading by 30°. [6]

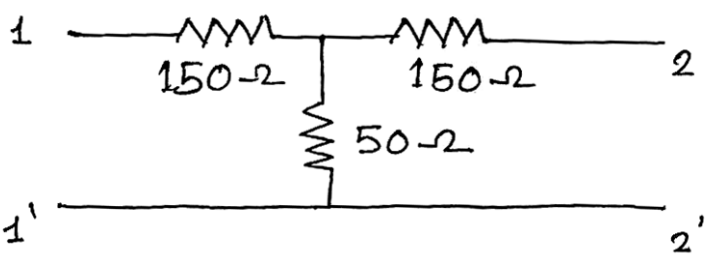


(*b*) The circuit shown below find, the current flowing through the inductor, when switch is at position 'A' and 'B'. [6]



5. (*a*) Design a HPF, 'T' and 'π' section to work into impedance 500 Ω, and have a cut-off frequency of 1 kHz. For this, calculate the phase angle 'β' at frequency 1.5 kHz and attenuation 'α' in neper at frequency of 0.9 kHz. [7]

(*b*) A symmetrical 'T' attenuator shown below. Find OC & SC impedance, Z_0. attenuation conatant in dB : [6]

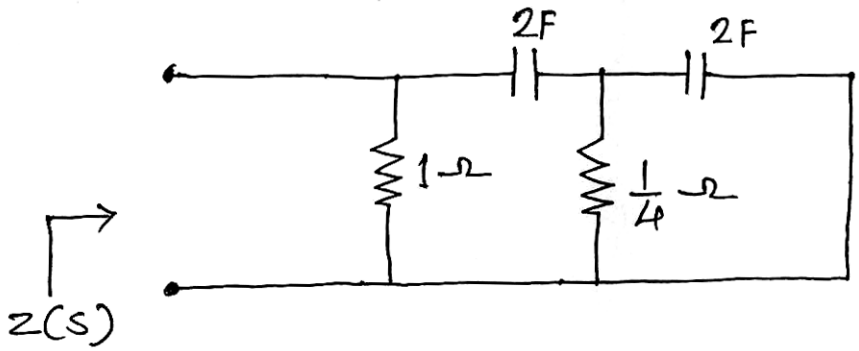


Or

6. (*a*) Design a constant 'K' Π section HPF to have a design impedance of 600 Ω The filter must have attenuation of 8.11 dB at 4.5 kHz and for this design calculate, phase angle in degree at frequency 5.5 kHz. [6]

(*b*) Find the image and iterative impedance for the asymmetrical 'L' section whose series arm impedance is 400 Ω and shunt arm impedance is 600 Ω. Derive the formula used. [7]

7. (*a*) What is meant by poles and zeros ? For the network shown below find the Z(*s*) : [7]



(*b*) The Z-parameter of a circuit are given by : [6]

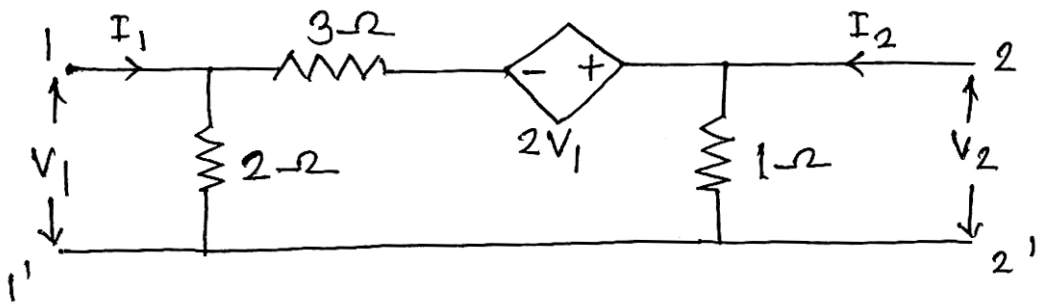
$$\begin{bmatrix} 4 & 1 \\ 3 & 3 \end{bmatrix}.$$

Obtain the transmission parameters.

Or

8. (*a*) Derive the condition of Reciprocity and symmetry for the ABCD parameter. [6]

(*b*) Determine the 'Y' parameters for the Network. [7]



Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

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[5152]-134

S.E. (E&TC/Electronics) (First Semester) EXAMINATION, 2017

DATA STRUCTURES AND ALGORITHM

(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.

1. (*a*) What do you mean by recursive function ? Explain with example. [6]

(*b*) Write a C function for linear search. Discuss its time complexity. [6]

Or

2. (*a*) Explain parameter passing by value and passing parameter by reference with suitable example. [6]

(*b*) What is pointer ? Explain advantages of pointer, pointer declaration and its initialization with an example. [6]

3. (*a*) What is priority queue ? What are various ways of implementing priority queue ? Explain any *one* : [6]

(*b*) Explain the following : [6]

(*i*) Garbage collection

(*ii*) Garbage compaction.

P.T.O.

Or

4. (*a*) Convert the following expression into postfix format with all steps and stack contents during every step : [6]

(a + (b * c/d) –e)

(*b*) Write short notes on : [6]

(*i*) Singly linked list and

(*ii*) Doubly linked list.

5. (*a*) What is BST ? Write C function for : [7]

(*i*) Finding smallest no. in BST

(*ii*) Recursive inorder traversal of BST

(*b*) What is AVL Tree ? Define balance factor. Explain RR rotation. [6]

Or

6. (*a*) What is BST ? Conduct a BST for the following numbers : [8]

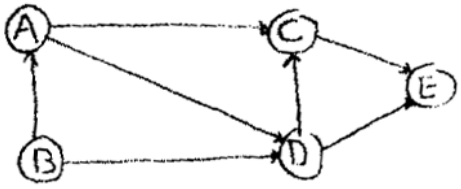
27, 42, 43, 17, 39, 31, 10, 9, 19, 54, 33, 48

Show all the steps. Write its preorder traversal.

(*b*) Explain treaded binary tree with an example. What is its advantage ? [5]

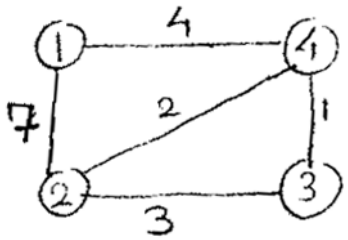
7. (*a*) Write a C function to implement DFS traversal of graph implemented using adjacency matrix. [7]

(*b*) Write topological sort for the following graph : [6]



8. (*a*) Define term graph with suitable example. Give adjacency matrix representation and adjacency list representation of the graph. [7]

(*b*) Define spanning tree. Find all the spanning tree for graph given below : [6]



Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-135

S.E. (Electronics & Telecomunication) (First Semester)

EXAMINATION, 2017

DIGITAL ELECTRONICS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

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*) Explain with neat diagram, interface of TTL gate driving CMOS gate and vice versa. [6]

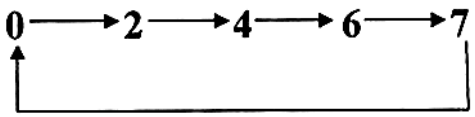
(*b*) Design a combinational circuit to produce the 2's complement of a 4 bit binary number as an input. [6]

Or

2. (*a*) Draw and explain the working of 2 input TTL NAND gate. [6]

(*b*) Design even parity generator circuit for 4-bit input using multiplexer. [6]

3. (*a*) By using suitable flip-flop design a counter to go through the following states. Avoid lock out condition. [6]



P.T.O.

(*b*) Explain : [6]

(*i*) State Table

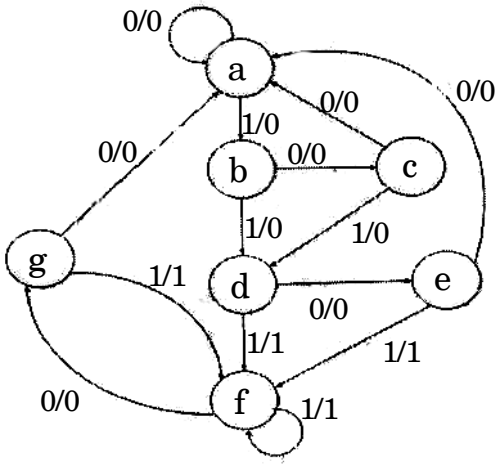
(*ii*) State Diagram

(*iii*) State Reduction.

Or

4. (*a*) Design a 3-Bit Binary Up/Down Ripple Counter. Draw the Timing Diagram. [5]

(*b*) For given state diagram (Figure given below) prepare State Table and reduce the same using 'State Table Reduction'. [7]



5. (*a*) Explain in detail architecture of CPLD. [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*) Explain difference between CPLD and FPGA. [5]

(*b*) Implement the following Boolean function using PAL : [8]

$Y_1(A, B, C, D) = \Sigma m(1, 3, 4, 6, 9, 11, 12, 14)$

$Y_2(A, B, C, D) = \Sigma m(1, 3, 4, 6, 9, 11, 12, 14, 15)$

$Y_3(A, B, C, D) = \Sigma m(0, 2, 4, 6, 8, 12)$

$Y_4(A, B, C, D) = \Sigma m(2, 3, 8, 9, 12, 13)$

7. (*a*) Explain the following Sequential Statements used in VHDL with suitable example : [8]

(*i*) If then Else statement

(*ii*) Case statement

(*iii*) Loop statement

(*iv*) Process statement.

(*b*) Write a VHDL code for JK Flip-Flop using asynchronous reset input. [5]

Or

8. (*a*) Explain the difference between concurrent statement and sequential statement in VHDL. [6]

(*b*) Write a VHDL code for 2-Bit comparator using behavioral modeling style. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**5**

Seat No.	

[5152]-137

S.E. (Electronics/E&TC) (II Sem.) EXAMINATION, 2017

CONTROL SYSTEM

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Figures to the right indicate full marks.

(*ii*) *All* questions carry equal 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*) State any *six* rules of block diagram reduction. [6]

(*b*) For unity feedback system with open loop transfer function $G(s) = \frac{25}{s(s + k)}$ determine damping factor, k, peak overshoot, peak time if settling time with 2% criterion is 2 seconds. [6]

P.T.O.

Or

2. (*a*) Determine the transfer function $\frac{X_2(s)}{F(s)}$ for the system shown in Fig. 1 : [6]

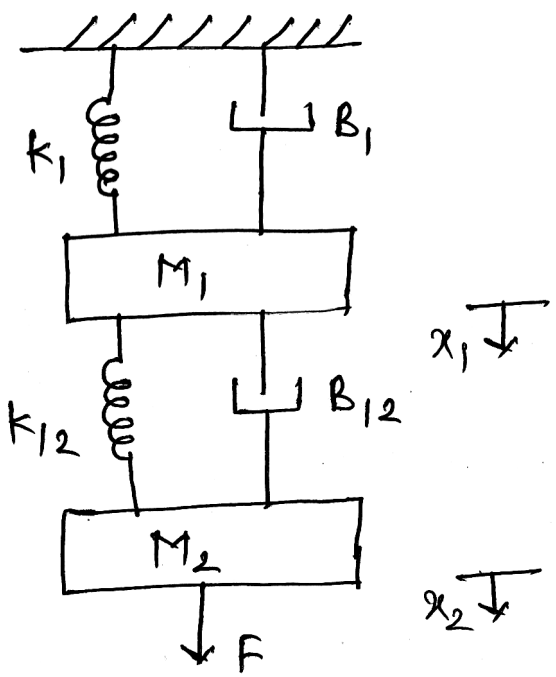


Fig. 1

(*b*) For the system with closed loop transfer function :

$$G(s) = \frac{16}{s^2 + 4s + 16}$$

determine rise time, peak time, peak overshoot, settling time with 2% criterion. [6]

3. (*a*) Determine the range of k for the closed loop stability of unity feedback system with open loop transfer function :

$$G(s) = \frac{k}{s(s + 1)(s + 4)}$$

Also determine the frequency of oscillations when the system is marginally stable. [4]

(*b*) Draw Bode plot of the system with open loop transfer function :

$$G(s) = \frac{8}{s(s + 2)(s + 4)}.$$

Determine stability margins (gain and phase) and the corresponding frequencies. Comment on stability. [8]

Or

4. (*a*) Determine the value of k if damping factor is $\xi = 0.5$ for the unity feedback system with open loop transfer function $G(s) = \frac{k}{s(s + 4)}$. Also determine resonant peak and resonant frequency. [4]

(*b*) Sketch the root locus of the system with open loop transfer function $G(s) = \frac{k}{s(s + 3)(s + 5)}$. [8]

5. (*a*) Determine state transition matrix of : [6]

$$A = \begin{bmatrix} 0 & 1 \\ -3 & -4 \end{bmatrix}.$$

(*b*) Derive the formula to determine transfer function from state model $\dot{x} = Ax + Bu$, $y = Cx + Du$ and determine transfer function if : [7]

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

Or

6. (*a*) Investigate for state controllability and state observability of the system with state space model matrices : [7]

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

(*b*) For the system with transfer function :

$$G(s) = \frac{s^2 + 3s + 4}{s^3 + 2s^2 + 7s + 3}$$

obtain the state space representation in controllable canonical form and observable canonical form. [6]

7. (*a*) Explain the process of bottle filling plant with neat diagram and draw a ladder diagram for this application. Assume that all switches/relays are operated based for sensor signals and the operation is not timer based. [6]

(*b*) Obtain pulse transfer function and impulse response of the system shown in Fig. 2 : [7]

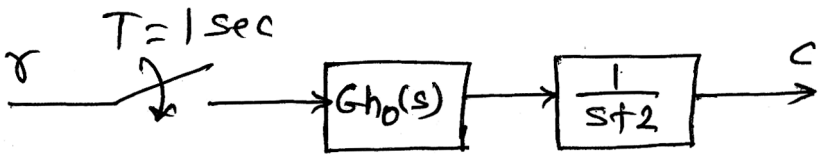


Fig. 2

Or

8. (*a*) Write equation of PID controller and sketch the response of P, PI and PID controller to unit step input. [6]

(*b*) Obtain pulse transfer function C(*z*)/R(*z*) for the system shown in Fig. 3 using first principle (starred Laplace transform method) : [7]

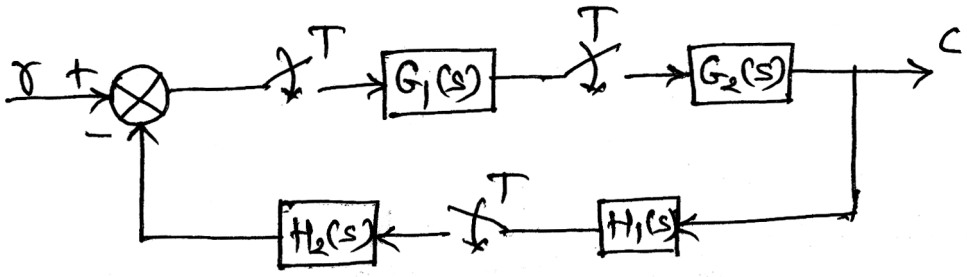


Fig. 3

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

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S.E. (E&TC/Elections) (Second Semester) EXAMINATION, 2017

ANALOG COMMUNICATION

(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 diagram must be drawn wherever necessary.

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

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

1. (*a*) State and compare different SSB generation methods. [6]

(*b*) Consider an angle modulated signal.

$x(t) = 10 \cos(\omega ct + 3 \sin \omega mt)$ assume PM and f_m = 1KHz. Calculate the modulation index and find the bandwidth when :

(*i*) Fm is doubled

(*ii*) Fm is decreased by one half [6]

Or

2. (*a*) An audio frequency signal $10 \sin(2\pi \times 500t)$ is used to amplitude modulate a carrier of $50 \sin(2\pi \times 10^5)$. Calculate :

(*i*) Modulation index

(*ii*) Sideband frequencies

P.T.O.

(*iii*) Amplitude of each sideband frequencies

(*iv*) Bandwidth

(*v*) Total power delivered to load of 600Ω

(*vi*) Transmission efficiency [6]

(*b*) Explain Armstrong method of FM generation. [6]

3. (*a*) Explain the following :

(*i*) Double spotting

(*ii*) Image frequency rejection

(*iii*) Fidelity [6]

(*b*) Three resistors have values R1 = 10 KΩ, R2 = 14 KΩ and R3 = 24 KΩ. It is known that thermal noise voltage generated by R1 is 0.3 μv. Calculate thermal noise voltage generated by :

(*i*) Three resistors connected in series

(*ii*) Three resistors connected in parallel. [6]

Or

4. (*a*) Explain with waveform and block diagram AM superheterodyne receiver. [6]

(*b*) Derive Friss formula for noise factor of cascaded amplifier. [6]

5. (*a*) Explain the performance of SSB-SC in presence of noise.[7]

(*b*) Explain importance of pre-emphasis and De-emphasis in FM system. [6]

Or

6. (*a*) Derive expression for signal to noise ratio in DSBSC system. [6]

(*b*) Explain the performance of FM in presence of noise. [7]

7. (*a*) State and prove sampling theorem with suitable waveform and mathematical expression. [7]

(*b*) What is aliasing ? How is it reduced ? [6]

Or

8. (*a*) Explain with the block diagram and waveform PAM. [6]

(*b*) With the help of block diagram explain transmitter and receiver of PCM. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[5152]-139

S.E. (E & TC/Electronics) (II Sem.) EXAMINATION, 2017

COMPUTER ORGANIZATION

(2012 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*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
(*iv*) Assume suitable data, if necessary.

1. (*a*) What do you understand about pipelining ? Explain with suitable example. [6]

(*b*) Perform the following division using restoring algorithm : [6]
divided=1001 and . divisor=0101

Or

2. (*a*) What is basic performance equation and how is it related to clock rate and compiler design ? [6]

(*b*) Reprint the following numbers into single precision and double precision format : [6]
(*i*) 309.1875
(*ii*) 178.1875.

3. (*a*) Give the difference between hardwired control and micro-programmed control. [6]

P.T.O.

(*b*) What is an interrupt ? What is the response of the CPU after recognition of interrupt ? [6]

Or

4. (*a*) What is multiple bus organization ? [6]

(*b*) Explain exception used for debugging the program. [6]

5. (*a*) Explain cache memory. Why is it used ? [7]

(*b*) Draw 1 bit memory cell and how it works. [6]

Or

6. (*a*) Explain the connection of the memory to the processor. [7]

(*b*) Write a note on semiconductor RAM memories. [6]

7. (*a*) Draw architecture of 8086. [7]

(*b*) Explain pipelining concept for 8086. [6]

Or

8. (*a*) Explain Logical to physical addressing of 8086. [7]

(*b*) Explain Segment Registers of 8086. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**6**

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[5152]-140

S.E. (Electronics/E&TC) (Second 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 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*) $\left(D^2 + 2D + 1\right)y = xe^{-x}\cos x$

(*ii*) $\left(D^2 - 6D + 9\right)y = \frac{e^{3x}}{x^2}$

(*iii*) $x^2\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} - 6y = x^5.$

P.T.O.

(*b*) Find Fourier transform of : [4]

$$f(x) = \begin{cases} x & |x| \le a \\ 0 & |x| > a \end{cases}$$

Or

2. (*a*) A resistance of 50 Ω, an inductance of 2 henries and a 0.005 farad capacitor is in series with an e.m.f. of 40 volts and an open switch. Find the instantaneous charge and current after the switch is closed at time $t = 0$, assuming that at that time the charge on the capacitor is 4 coulomb. [4]

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

(*i*) Find z-transform of $f(k) = k5^k$, $k \ge 0$.

(*ii*) Find inverse z-transform of : [4]

$$\frac{z^2}{\left(z - \frac{1}{2}\right)\left(z - \frac{1}{3}\right)}, |z| > \frac{1}{2}.$$

(*c*) Solve : [4]

$f(k + 2) + 3f(k + 1) + 2f(k) = 0$, $f(0) = 0$, $f(1) = 1$.

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

(*b*) Find Lagrange's interpolating polynomial satisfying the data : [4]

x	y
0	3
1	5
3	15
4	35

(*c*) In what direction from the point (2, 1, –1) is the directional derivative of $\phi = x^2yz^3$ a maximum ? What is the magnitude of this maximum ? [4]

Or

4. (*a*) Show that (any *one*) : [4]

(*i*) $\nabla^2\left(r^2 \log r\right) = 5 + 6\log r$

(*ii*) $\nabla \times \left[\bar{a} \times \left(\bar{b} \times \bar{r}\right)\right] = \bar{a} \times \bar{b}$.

(*b*) Show that : [4]

$$\bar{F} = \left(6xy + z^3\right)\bar{i} + \left(3x^2 - z\right)\bar{j} + \left(3xz^2 - y\right)\bar{k}$$

is irrotational. Find scalar potential ϕ such that $\bar{F} = \nabla\phi$.

(*c*) Evaluate : [4]

$$\int_1^2 \frac{dx}{x^2}$$

using Simpson's $\left(\frac{1}{3}\right)$rd rule, taking $h = 0.25$.

5. (*a*) Evaluate : [5]

$$\int_C \bar{F} \cdot d\bar{r}$$

where $\bar{F} = z\bar{i} + x\bar{j} + y\bar{k}$ and C is the arc of the curve $x = \cos t$, $y = \sin t$, $z = t$ from $t = 0$ to $t = \pi$.

(*b*) Evaluate : [4]

$$\iint_S \left(\nabla \times \bar{F}\right) \cdot \hat{n}\, dS$$

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

(*c*) If $\bar{E} = \nabla\phi$ and $\nabla^2\phi = -4\pi\rho$ prove that : [4]

$$\iint_S \bar{E} \cdot d\bar{S} = -4\pi \iiint_V \rho dV.$$

Or

6. (*a*) Using Green's Theorem evaluate : [5]

$$\int_C \left(\frac{1}{y}dx + \frac{1}{x}dy\right)$$

where C is the boundary of the region bounded by the parabola $y = \sqrt{x}$ and lines $x = 1$ and $x = 4$.

(*b*) Using Stokes' Theorem, evaluate : [4]

$$\int_C \bar{F} \cdot d\bar{r}$$

where $\bar{F} = 3y\bar{i} + 2x\bar{j}$ and C is the boundary of the rectangle $0 \leq x \leq \pi$, $0 \leq y \leq 1$ and $z = 3$.

(*c*) Prove that : [4]

$$\int_C (\bar{a} \times \bar{r}) \cdot d\bar{r} = 2\bar{a} \cdot \iint_S d\bar{S}$$

where S is any open surface with boundary C.

7. (*a*) If $f(z) = u + iv$ is an analytic function with $v = 3x^2y - y^3$, find u and express $f(z)$ in terms of z. [4]

(*b*) Evaluate : [4]

$$\int_C \frac{4z^2 + z}{z^2 - 1} dz$$

where C is $|z - 1| = \frac{1}{2}$.

(*c*) Find the bilinear transformation which maps the points $-1, 1, 0$ from z-plane into the points $0, 3i, i$ of the W-plane. [5]

Or

8. (*a*) Prove that an analytic function with constant argument is constant. [4]

(*b*) Evaluate : [4]

$$\int_C \frac{z^3 - 5}{(z+1)^2 (z-2)} dz$$

where C is $|z| = \frac{3}{2}$.

(*c*) Show that the transformation $W = z + \frac{1}{z} - 2i$ maps the circle $|z| = 2$ onto an ellipse. [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

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[5152]-142

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

POWER GENERATION TECHNOLOGY

(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*) Assume suitable data, if necessary.

1. (*a*) What is draught system in thermal power plant ? Differentiate between artificial and forced draught. [7]

(*b*) Explain the site selection of nuclear power plant. [5]

Or

2. (*a*) With the help of neat diagram explain the main components and working of diesel power plant. [7]

(*b*) Explain *one* method of control of steam turbines in thermal power plants. [5]

3. (*a*) Explain the terms storage and pondage. [6]

(*b*) How the wind pattern affect power generation in wind energy systems ? [7]

P.T.O.

Or

4. (*a*) With the help of sketch explain Pelton wheel turbine. [7]

(*b*) Write short note on wind turbine power converters. [6]

5. (*a*) Develop simple equivalent circuit for a PV cell. [6]

(*b*) Explain the impacts of temperature and insolation I-V curves of PV cell. [7]

Or

6. (*a*) Define and explain the terms : [6]

(*i*) Solar constant

(*ii*) Concentration ratio.

(*b*) Explain solar energy collectors used for solar thermal applications. [7]

7. (*a*) Explain with the help of sketch the process of biomass energy conversion to electricity. [6]

(*b*) Describe the harnessing the ocean energy to produce electricity. [6]

Or

8. (*a*) Explain how renewable energy systems can be connected to grid. [7]

(*b*) How fuel cell energy is helpful in energy storage system ? [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-143

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

MATERIAL SCIENCE

(2012 Course)

Time : Two Hours **Maximum Marks : 50**

Physical Constants :

(*i*) Angstrom Unit (AU) = 1×10^{-10} metres

(*ii*) Boltzmann's Constant (k) = 1.380×10^{-23} joule-degree^{-1}

(*iii*) Charge on Electron (e) = 1.601×10^{-19} coulomb

(*iv*) Mass of Electron (m) = 9.107×10^{-31} kg

(*v*) Electron volt (eV) = 1.602×10^{-19} joules

(*vi*) Mass of Proton (m_p) = 1.627×10^{-27} kg

(*vii*) Velocity of light (c) = 2.998×10^{8} m/sec

(*viii*) Dielectric constant of free space (ε_0) = 8.854×10^{-12} F/m

(*ix*) Permeability of free space (μ_0) = $4\pi \times 10^{-7}$ H/m

(*x*) Debye Unit = 3.33×10^{-30} coulombmetre.

1. (*a*) Explain the terms Polarizability and Susceptibility with reference to dielectric material. [6]

(*b*) What are the required properties of a good insulating material. [6]

Or

2. (*a*) Write a note on mechanisms of polarization. [6]

(*b*) Write a note on insulating materials used in transformer. [6]

P.T.O.

3. (*a*) Compare soft magnetic material and hard magnetic materials. [6]

(*b*) The resistivity of pure copper is 1.7 μΩ-cm. An alloy of copper containing 1 atomic percent nickel has resistivity of 2.97 μΩ-cm. An alloy of copper containing 3 atomic percent gold has a resistivity of 1.9 μΩ-cm. What is the resistivity of alloy containing 2 atomic percent nickel and 2 atomic percent gold ? [6]

Or

4. (*a*) In a magnetic material, an application of a magnetic field of 0.2×10^6 A/m results into a flux density of 1 tesla. Calculate its permeability, susceptibility and magnetisation. [6]

(*b*) Write a short note on thermocouple with its neat diagram and its principle of working. [6]

5. (*a*) Write a short note on Carbon Nano Tubes (CNTs). [7]

(*b*) Write a short note on C_{60}. [6]

Or

6. (*a*) Write a short note on BN Nano Tubes. [7]

(*b*) Write a short note on Single Electron Transistor (SET). [6]

7. (*a*) What is partial discharge of a dielectric ? Explain the method to determine partial discharge of solid dielectric. [7]

(*b*) With neat sketch, explain measurement of dielectric strength of transformer oil. [6]

Or

8 (*a*) Describe the method of measurement of tan δ of a dielectric by Schering bridge as per IS code of practice. [7]

(*b*) Describe the method to determine the breakdown strength of air in the laboratory as per IS. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-144

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

ANALOG AND DIGITAL ELECTRONICS

(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*) Assume suitable data, if necessary.

(*v*) Use of non-programmable calculator is allowed.

1. (*a*) Perform the following arithmetic operations Convert : [6]

(*i*) $(623.77)_8 = (\ )_{10}$

(*ii*) $(2ACF.D)_{16} = (\ )_8$

(*b*) Write short notes on : [6]

(*i*) Gray code and its binary conversion

(*ii*) Excess-3 code

Or

2. (*a*) Explain the working of serial input serial output shift (SISO) register with a neat circuit diagram. [6]

(*b*) Explain the working of Master–Slave JK flip-flop. [6]

P.T.O.

3. (*a*) Explain the function of 78XXX and 79XX voltage regulator. [6]

(*b*) Explain OP AMP as a V-I & I-V converter. [7]

Or

4. (*a*) Compare open loop & closed loop configuration of OP-AMP. [6]

(*b*) Draw neat diagram & explain operation of OP-AMP as square wave generator with waveforms. [7]

5. (*a*) Write a short note on Darlington pair. [6]

(*b*) Define important parameters of JFET. [7]

Or

6. (*a*) Write short note on Push Pull amplifier with waveforms. [7]

(*b*) Draw and explain RC coupled amplifier with frequency response. [6]

7. (*a*) Explain the working of single phase full wave bridge rectifier with R load and draw its output voltage and current waveforms. [6]

(*b*) Why filters are required ? Explain LC Filter. [6]

Or

8. (*a*) Explain working of three phase full wave bridge rectifier with R load. [6]

(*b*) A half wave rectifier employs a diode having forward resistance if 10 ohm. If input voltage to the rectifier circuit is 12 V rms, find the dc output voltage at a load of 100 mA and PIV. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-145

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

ELECTRICAL MEASUREMENTS AND 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.

1. (*a*) Draw a neat schematic diagram of Repulsion type moving iron instrument and explain deflecting, controlling and damping system used in it. [6]

(*b*) With a circuit diagram derive the equation for an unknown self-inductance by Maxwell's inductance-capacitance bridge. [6]

Or

2. (*a*) Explain the terms transformation ratio, nominal ratio and burden. [6]

(*b*) Describe the ammeter-voltmeter method for measurement of resistances. [6]

P.T.O.

3. (*a*) Draw the possible method of connecting the pressure coil of a wattmeter and compare the errors. Explain the use of "compensation winding" in a wattmeter. [6]

(*b*) A 230 V single phase energy meter has constant load of 5 A passing through it for 8 hours at a power factor of 0.9. If the meter LED makes 26500 impulses during this period, find the meter constant in imp/kWh. Calculate the power factor of the load if the no. of impulses are 11230 when operating at 230 V and 6 A for 5 hour. [7]

Or

4. (*a*) While performing a load test on a 3-phase wound rotor induction motor by two wattmeter method, the readings obtained on two wattmeters were +14.2 kW and –6.1 kW and line voltage was 440 V. Calculate :

(*i*) True power drawn by the motor

(*ii*) Power factor

(*iii*) Line current. [6]

(*b*) With a block diagram explain operation of Electronic energy meter. [7]

5. (*a*) Explain the following terms associated with CRO : [6]

(*i*) Volts/division

(*ii*) Invert

(*iii*) dual ch

(*iv*) x-position

(*v*) xy-mode

(*vi*) y-position.

(*b*) Explain capacitive transducers for pressure measurement with a neat diagram. [6]

Or

6. (*a*) Explain measurement of voltage, current and phase angle using CRO. [6]

(*b*) Explain Pirani gauge for measurement of pressure. [6]

7. (*a*) Explain level measurement by ultrasonic method. [6]

(*b*) What are the types of strain gauge ? Explain semi-conductor strain gauge. [7]

Or

8. (*a*) Explain Electrical method for measurement of level. [6]

(*b*) What are the advantages and disadvantages of a Linear Variable Differential Transformer (LVDT) ? Explain how the magnitude and direction of displacement of core of an LVDT detected ? [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-146

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

POWER SYSTEM—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* 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*) Discuss advantages and limitations of interconnected grid system. [6]

(*b*) Explain in brief the necessity and working of the following equipments used in substation : [6]

(*i*) Busbars

(*ii*) Reactors.

Or

2. (*a*) What is meant by tariff ? What are the objectives of tariff ? [6]

(*b*) A 3-phase line is supported by a string of 3 suspension type disc insulators. The voltage across the disc nearest to the

P.T.O.

line is 20 kV and that across the adjacent units is 15 kV. Find :

(*i*) ratio of the capacitance of joint to capacitance of disc

(*ii*) System line voltage

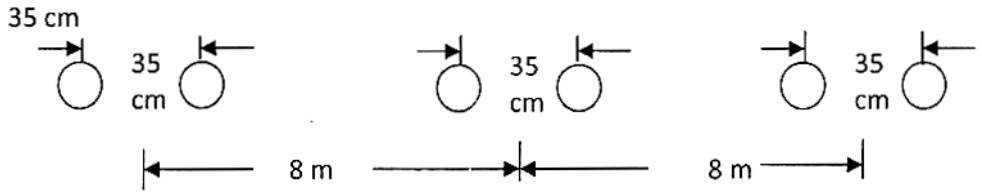
(*iii*) String efficiency. [6]

3. (*a*) Define Sag and Span of a transmission line. With neat diagram derive an expression for sag when the supports are at equal level. [7]

(*b*) What is meant by transposition of conductors in an overhead line ? Why is it essential ? How is it carried out ? [6]

Or

4. (*a*) A three-phase single circuit bundled conductor line with two sub-conductors per phase has horizontal spacing with 8 m between the centre lines of adjacent phases. The distance between the sub-conductors of each phase is 35 cm and each sub-conductor has a diameter of 2.8 cm. Find the inductance per phase per km of the line. [7]



(*b*) Derive an expression for capacitance of a single core cable. [6]

5. (*a*) Derive an expression for capacitance of 1-phase transmission line without considering effect of earth. [6]

(*b*) A 3-phase, 50 Hz, 132 kV overhead line has conductors placed in horizontal plane 4.5 m apart. Conductor diameter is 22.4 mm. Line length is 200 km. Calculate charging current per phase assuming complete transposition. [6]

Or

6. (*a*) Capacitance of single-phase, 50 km long transmission line considering effect of earth is 0.225 μF. Overhead line consisting of two parallel conductors each of 0.5 cm diameter and 1.5 m apart. Calculate height of conductors above the ground. [6]

(*b*) Derive an expression for capacitance of 3-phase transmission line when conductors are unsymmetrically spaced but transposed. [7]

7. (*a*) Evaluate the generalized circuit constants for medium transmission line with Nominal 'π' method. [6]

(*b*) Obtain the expression of voltage regulation and efficiency of short transmission line in terms of line parameters. [6]

Or

8. (*a*) With neat circuit diagram, prove that for any transmission line with generalized circuit constants as ABCD, value of AD – BC = 1. [6]

(*b*) The A, B, C, D constants of a 3-phase transmission line are

$$A = D = 0.978 + j\ 0.051,$$

$$B = 28.47 + j\ 106.25\ \Omega \text{ and}$$

$$C = j5^{*}\ 10^{-4}\ \text{mho}.$$

The load at the receiving end is 40 MW at 200 kV and 0.8 lagging power factor. Determine sending end voltage and % regulation of line. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-147

S.E. (Electrical) (II Sem.) EXAMINATION, 2017

ELECTRICAL MACHINES

(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** *or* 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 scientific calculator is allowed.

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

1. (*a*) Draw the neat connection diagrams and explain the OC and SC test on 1-ph transformer for finding voltage regulation and efficiency. [6]

(*b*) Explain the Scott connection for 3-ph to 2-ph power conversion. [6]

Or

2. (*a*) Why parallel operation of transformers is necessary ? State the conditions to be satisfied for parallel operation of 1-ph transformer. [6]

(*b*) A 500 kVa, 1-ph, 50Hz, transformer has efficiency of 90% both at full load and half load with unity power factor. Determine its efficiency at 75% of full load and power factor 0.8 lagging. [6]

P.T.O.

3. (*a*) Obtain the equations for armature torque, shaft torque and lost torque. [6]

(*b*) Sketch and explain 3-point starter. [6]

Or

4. (*a*) Draw the power flow diagram for DC motor and explain. [6]

(*b*) A 37.3 kW, 500V, DC shunt motor on full load runs at 1000 rpm has efficiency of 92%. It have R_a = 0.25 Ω and R_{sh} = 250 Ω. Determine : [6]

(*i*) Full load line current

(*ii*) Full load shaft torque and

(*iii*) Starter resistance to limit starting current to 1.5 times the full load current.

5. (*a*) Explain the construction of 3-phase induction motor. [6]

(*b*) 3-phase, 50 Hz, 6-pole induction motor running at 960 rpm at full load and develops a torque of 160 N-m. The rotational losses are 300 W and that of the stator iron and copper loses are 1820 W. Calculate :

(*i*) Output power

(*ii*) Rotor copper loss and

(*iii*) Efficiency at full load. [7]

Or

6. (*a*) Obtain the relation between : [6]

(*i*) Starting torque/full load torque

(*ii*) Full load torque/max. torque.

(*b*) A 50Hz, 8-pole, 3-phase induction motor has full load speed 720 rpm. Rotor resistance per phase = 0.01 Ω and standstill rotor reactance is 0.1 Ω/ph. Find the ratio of full load torque to maximum torque and speed at which maximum torque occurs. [7]

7. (*a*) Explain the no load and blocked rotor test on 3-phase induction motor to determine equivalent circuit parameters. [6]

(*b*) Sketch and explain circle diagram. [7]

Or

8. (*a*) Explain the testing of 3-phase induction motor as per IS-325. [6]

(*b*) Draw the neat connection diagram and explain the operation of star-delta starter. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+1**

Seat No.	

[5152]-148

S.E. (Electrical Engineering) (Second Semester)

EXAMINATION, 2017

NETWORK ANALYSIS

(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 necesary.

(*iii*) Figures to the right side indicate full marks.

(*iv*) Use of calculator is allowed.

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

1. (*a*) Reduce the given network figure 1 to a single voltage source and impedance. [7]

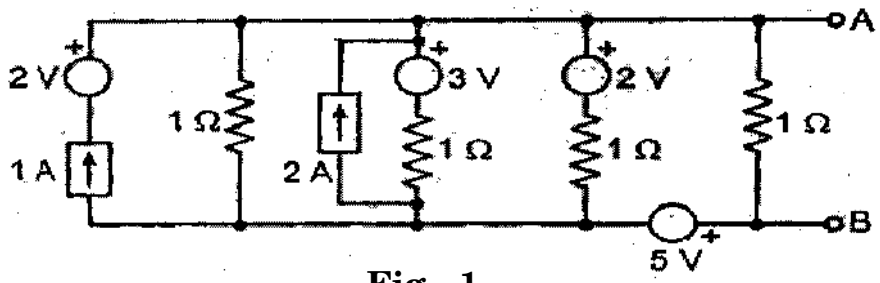


Fig. 1

P.T.O.

(*b*) Find Voltage at node **1** by using Nodal Analysis technique as shown in fig. (2) [6]

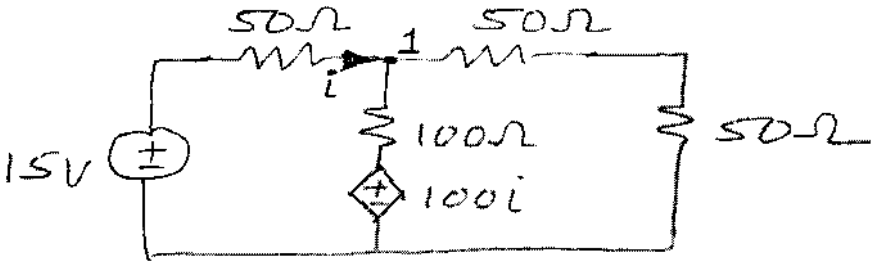


Fig. 2

Or

2. (*a*) Find current through (3–*j* 4) Ω by using Superposition Theorems as shown in fig. (3) [7]

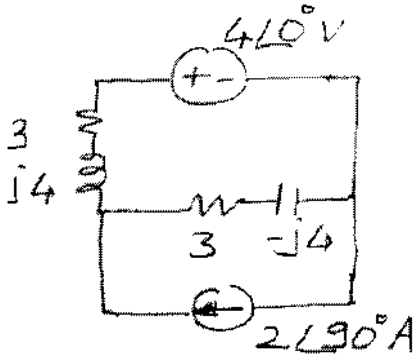


Fig. 3

(*b*) Draw the dotted equivalent circuit of the coupled circuit shown and hence find voltage across capacitor by mesh analysis. [6]

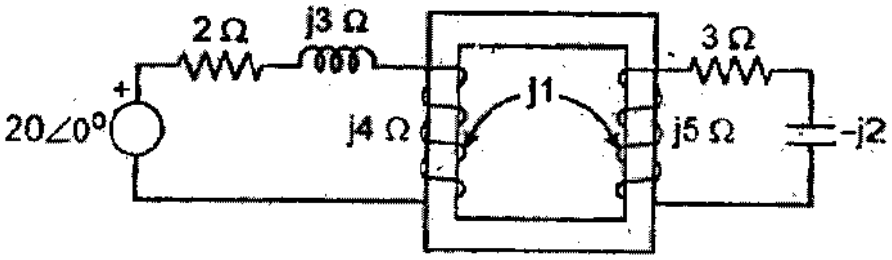


Fig. 4

3. (*a*) In the circuit, the switch S1 is closed at time $t = 0$, and switch S2 is closed at time $t = 0.1$ sec, find the transient current by using classical theory and also draw this current for two intervals. [7]

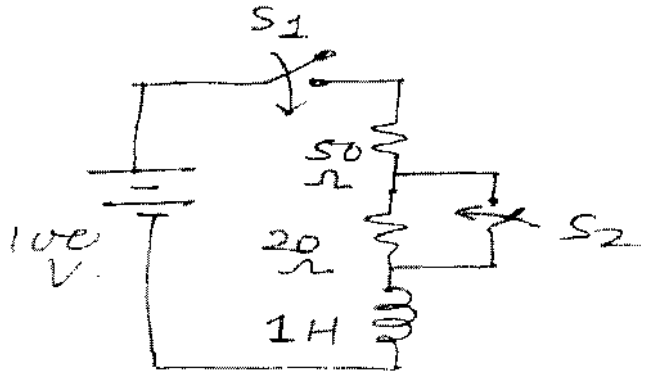


Fig. 5

(*b*) R-L-C circuit is excited by DC voltage source. Find Current $i(t)$ using conventional method. The switch is closed at time $t = 0$ [6]

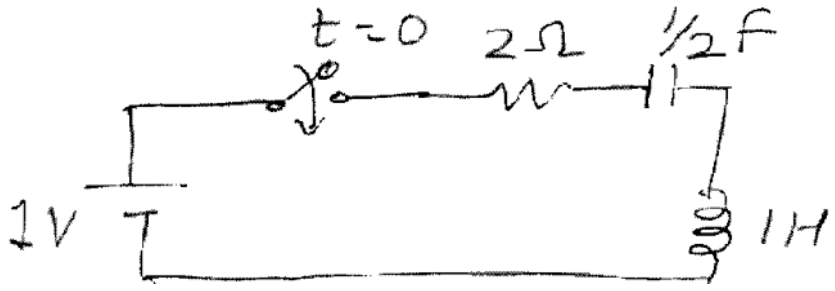


Fig. 6

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]

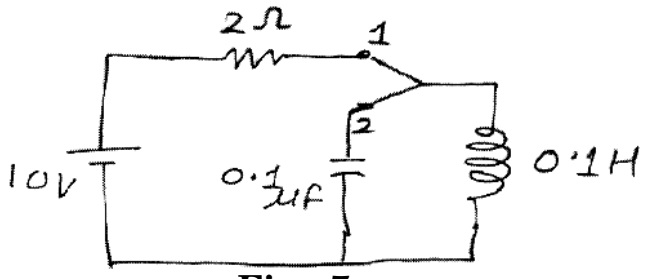


Fig. 7

(*b*) Obtain $f(t)$ for the function $f(s)$, using Convolution Integral. $F(S) = 10/(S^2 + 7S + 12)$ [6]

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

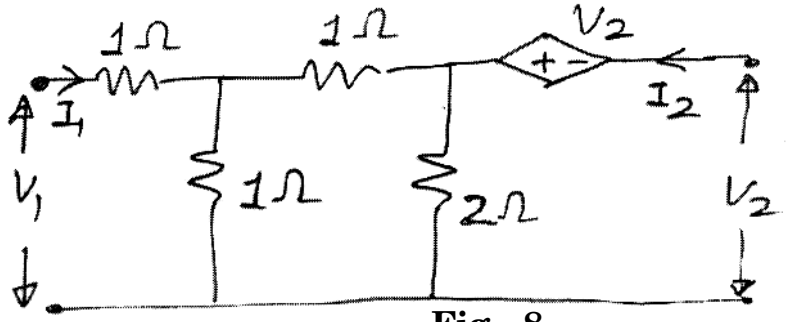


Fig. 8

(*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. [6]

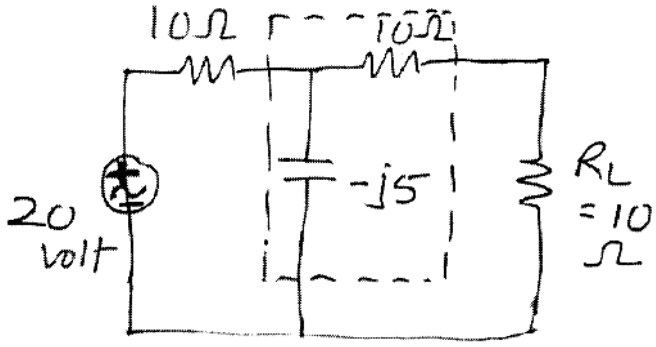


Fig. 9

Or

6. (*a*) Design the High pass filter and develop relation of inductance and capacitance in terms of cut-off frequency & design resistance. [6]

(*b*) Obtain Z parameter of network as shown in Fig. 10. [6]

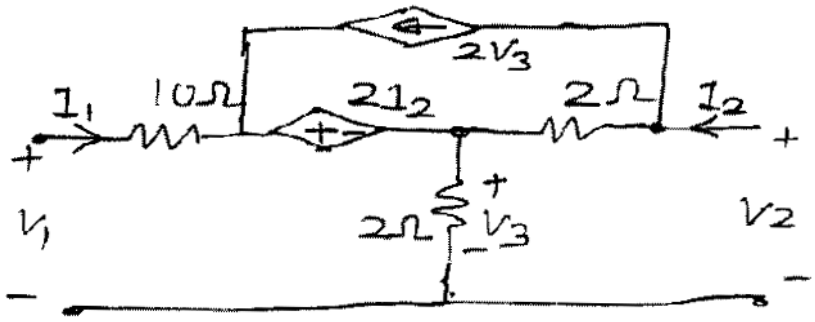


Fig. 10

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

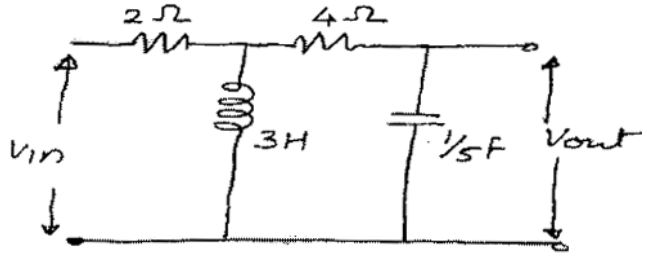


Fig. 11

(*b*) A parallel resonant circuit has a coil of 120 micro hennery, Quality factor is 600 and anti resonant frequency of 1 mega hertz, specify the value of capacitance, internal resistance of coil and impedance offered by circuit at resonance. [6]

Or

8. (*a*) For the network shown in Fig 12, find input admittance Y_{in} [6]

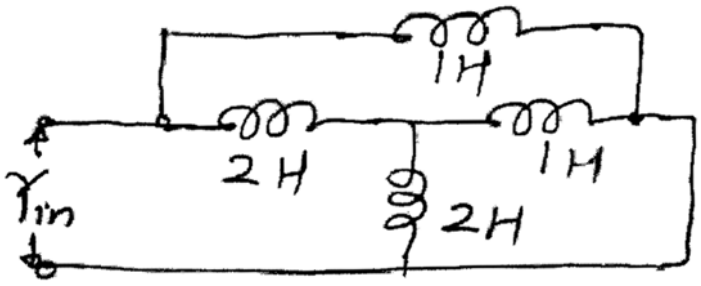


Fig. 12

(*b*) Draw the time domain wave form for various types of transfer function & comment on stability of system. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

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[5152]-149

S.E. (Electrical) (II Sem.) EXAMINATION, 2017

NUMERICAL METHODS AND COMPUTER PROGRAMMING

(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** and Q. **7** or Q. **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*) What do you understand by entry controlled loop and exit controlled loop ? Draw flow chart. Give egs of both the types of loops. [6]

(*b*) Determine the number of possible roots by Descarte's rule of sign for the given example : [6]

$$f(x) = x^4 - 5x^3 - x^2 + 15x - 5 = 0 .$$

P.T.O.

Or

2. (*a*) What are different types of data types in C language ? Explain each with their ranges. [6]

(*b*) Using normalized floating point perform : [6]

(*i*) (100.312 E 25) + (81.813 E 27)

(*ii*) (100.312 E 25) × (81.813 E 27)

(*iii*) (0.4546 E 3) × (0.5454 E 8).

3. (*a*) Explain bisection method to find root of transcendental equation. [6]

(*b*) Apply Newton's forward formula to find $f(2.5)$: [7]

x	$f(x)$
0	0
5	0.0875
10	0.1763
15	0.2679
20	0.3640
25	0.4663
30	0.5574

Or

4. (*a*) Find the root of equation $x^2 + 12x + 7$ between (–2, –3) correct upto 4 decimal places using Newton-Raphson method. [6]

(*b*) Fit a straight line to the following data by the principle of least squares for the following pts : [7]

x	y
1	0.5
2	2.3
3	2.1
4	4.2
5	3.6
6	5.8
7	5.5

5. (*a*) Solve the given set of equations by Gauss Seidel method :

$$4x + y + z = 5$$
$$x + 6y + 2z = 19$$
$$-x - 2y + 5z = 10$$

Take $x^0 = y^0 = z^0 = 0$. Show 4 iterations. [7]

(*b*) Find inverse of the given matrix A by Gauss-Jordan method : [6]

$$A = \begin{bmatrix} 2 & 6 & 6 \\ 2 & 8 & 6 \\ 6 & 2 & 8 \end{bmatrix}.$$

Or

6. (*a*) Explain how to obtain solution of linear algebraic simultaneous equation by Jacobi method. [6]

(*b*) Find numerically the largest eigen value by power method. Show 5 iterations. [7]

$$A = \begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix} \qquad X_0 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

7. (*a*) Derive Euler's formula to solve $\frac{dy}{dx} = f(x, y)$. Also show graphically the effect of reduction of step size in the Euler's method. [6]

(*b*) Evaluate the double integral by Simpson's rule : [6]

$$\int_0^1 \int_0^1 e^{x+y}\, dx\, dy$$

Take $h = k = 0.5$.

Or

8. (*a*) Compute the integral by trapezoidal rule : [6]

$$\int_0^5 e^{-x^2}\, dx$$

Take $h = 0.5$.

(*b*) Using modified Euler's method, solve : [6]

$$\frac{dy}{dx} = y - x^2 + 1$$

Given $y_0 = 0.5$, $x_0 = 0$. Find $y(0.4)$. Take $h = 0.4$.

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-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 *four* questions.

(*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*) Assume suitable data, if necessary.

1. (*a*) Explain the following instruction of 8085 microprocessor LDA 3000 and LHLD 3000. [4]

(*b*) Draw 4K ROM interfacing with 8085 from 0000H. [4]

(*c*) Explain the function of pins of 8085 : [4]

(*i*) IO/$\overline{M}$

(*ii*) T0(P3.4).

Or

2. (*a*) Explain asynchronous type parallel data transfer techniques. [4]

P.T.O.

(*b*) Write down assembly language program for 8085 microprocessor to multiply two 8-bit numbers stored in memory location 4050H and 4051H. Store the result in 5000H and 5001H memory location. [4]

(*c*) Explain SIM intruction of 8085 microprocessor. [4]

3. (*a*) List the operating modes of 8255. Draw control word format of I/O mode and BSR mode. [7]

(*b*) Explain the format of IE and IP registers with function of each bit. [6]

Or

4. (*a*) With the help of interfacing diagram, explain interface of ADC0809 with 8085. [7]

(*b*) Explain the program status word in 8051. [6]

5. (*a*) Explain steps to transfer data serially in 8051 and importance of TI flag. [6]

(*b*) Explain the following instructions : [6]

(*i*) SWAPA

(*ii*) CJNE #08, NEXT

(*iii*) Push 00H.

Or

6. (*a*) Write an assembly language program to find square of number stored at a location D000H external RAM and store the LSB of the result at D001H and MSB of the result at D002H. [6]

(*b*) List the various addressing modes used in instruction set of 8051. Give an example of each. [6]

7. (*a*) Explain power factor measurement using 8085 with block diagram. [6]

(*b*) Explain with interfacing diagram, temperature measurement using 8051. [7]

Or

8. (*a*) How is energy measured using 8085 ? Explain with block diagram. Draw the flowchart for the same. [6]

(*b*) Draw and explain stepper motor control using 8051. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[5152]-152

S.E. (Instrumentation and Control Engineering)

(First Semester) 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**.

1. (*a*) What is power supply rejection ratio ? What is its effect on performance of op-amp ? [6]

(*b*) Define the following terms : [6]

(*i*) Slew rate

(*ii*) CMRR

(*iii*) Gain bandwidth product

(*iv*) Input offset voltage

Or

2. (*a*) Explain measurement of the Common Mode Rejection Ratio of Op-amp with neat circuit diagrams. [6]

(*b*) Derive the output voltage equation for the voltage-shunt feedback amplifier with neat circuit diagram. [6]

3. (*a*) Explain 3-input non-inverting voltage summer with equation and neat circuit diagram. [6]

(*b*) What is oscillator ? State Barkhausen criteria and design Wein bridge oscillator for f_o = 1 kHz with neat circuit diagram. Assume suitable data. [6]

P.T.O.

Or

4. (*a*) Implement following equation using OPAMP $V_o = 2V_1 - 3V_2 + 4V_3 - 5V_4$ where V_1, V_2, V_3, V_4 are input and V_o is output of OPAMP. Draw the circuit diagram. [6]

(*b*) Design Schmitt trigger circuit using OPAMP for UTP = 2V, LTP = 1V. Given supply voltages = ± 15V and saturation voltage = ± 13V. Draw circuit diagram. [6]

5. (*a*) Design a stable multivibrator for the duty cycle of 70% and frequency of 1 kHz. Assume suitable values. Also draw circuit diagram and waveforms. [8]

(*b*) Draw and design low voltage regulator using IC 723 for 5V. Assume suitable data. [5]

Or

6. (*a*) Explain the working of monostable multivibrator using IC 555. Draw input, output and charging capacitor waveforms. [8]

(*b*) How is IC 555 is used for 50% duty cycle ? [5]

7. (*a*) Explain second order Butterworth low-pass filter and also draw circuit diagram. [8]

(*b*) What is order of filter ? Draw ideal and practical responses for all filters [5]

Or

8. (*a*) Draw and explain frequency response of ideal low pass, high pass, band pass and band reject filters. [8]

(*b*) Define the following and explain their significance in voltage regulator : [5]

(*i*) Line regulation

(*ii*) Load regulation

Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[5152]-153

S.E. (Instrumentation and Control) (I Sem.) EXAMINATION, 2017

BASIC INSTRUMENTATION

(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*) 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*) Explain accuracy and precision. [6]

(*b*) Differentiate between PMMC and moving iron instrument. [6]

Or

2. (*a*) Derive the equation for loading effect of shunt connected instrument. [6]

(*b*) With neat circuit diagram, explain shunt type ohmmeter. [6]

3. (*a*) Suggest and explain a suitable bridge to measure unknown frequency of source of AC signal. [6]

(*b*) Explain frequency and phase shift measurement using CRO. [6]

P.T.O.

Or

4. (*a*) Explain 10 : 1 attenuator CRO probe. [6]

(*b*) In case of Wheatstone bridge : three arms have values of 1000 Ω each. The unknown arm is of 1139.5 Ω If bridge supply is 1 volt and null detector's resistance is 220 Ω, calculate current flowing through null detector. [6]

5. (*a*) What are the advantages of digital instruments over analog instruments ? [6]

(*b*) Draw block diagram of DMM and explain. Also give typical DMM specifications. [7]

Or

6. (*a*) Explain the digital tachometer. [7]

(*b*) Explain ultrasound distance meter. Which factors affects the accuracy in measurement ? [6]

7. (*a*) What is the need of recorder ? Explain strip chart recorder. [7]

(*b*) Write a note on 'Virtual Instrumentation'. [6]

Or

8. (*a*) Explain any *three* marking mechanisms in recorders. [6]

(*b*) Draw the diode-resistor wave shaping circuit for converting triangular into sine wave. Explain its working with suitable waveform. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[5152]-154

S.E. (First Semester) (Instru. & Control) EXAMINATION, 2017

PHOTONICS AND INSTRUMENTATION

(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 side 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*) List the properties of light and explain any *one* type of property. [10]

(*b*) State the Brewster's Law. [2]

3. (*a*) Define Optical Detector. List the different Thermal Detectors. [4]

(*b*) Explain the working construction of Incandescent Lamp. [8]

P.T.O.

Or

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

(*b*) Explain in short :

(*i*) Photomultiplier Tube

(*ii*) Photodiode. [4×2]

5. (*a*) Compare the different losses in Fiber optic cable. [7]

(*b*) Explain the following terms of Fiber cable :

(*i*) Wave guiding principles

(*ii*) Dielectric wave guide. [6]

Or

6. (*a*) Explain the concept in fiber optic cable material absorption losses and scattering losses. [6]

(*b*) What are different modes used in fiber optics ? Explain with diagram. [7]

7. (*a*) Explain with neat diagram Polarimeter. [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]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-155

S.E. (Instrumentation & Control) (Second Semester)

EXAMINATION, 2017

TRANSDUCERS AND SIGNAL CONDITIONING

(2012 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*) 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.

1. (*a*) Design signal conditioning circuit for temperature indicator with the following specifications :
(*i*) Sensor : RTD PT100 with temperature coefficient is 0.0039 ohm/deg.celcius.
(*ii*) Range : 0-200 Deg.Celcius
(*iii*) Output : 0-200 mV
(*iv*) Power supply : +/- 12 Volts [8]

(*b*) Explain need of linearization in signal conditioning. [4]

Or

2. (*a*) Design signal conditioning circuit for temperature indicator with the following specifications :
(*i*) Sensor : RTD PT100 with temperature coefficient is 0.0039 ohm/deg.celcius.

P.T.O.

(*ii*) Range : 0-200 Deg.Celcius

(*iii*) Output : 0-2V

(*iv*) Power supply : +/- 12 Volts [8]

(*b*) Explain need of filtering in signal conditioning. [4]

3. (*a*) Explain signal conditioning scheme for capacitive level sensor. What are the limitations of this type of sensor ? [6]

(*b*) Explain signal conditioning scheme for Linear Variable Differential Transformer (LVDT). [6]

Or

4. (*a*) Explain the functional blocks of signal conditioning used for inductive proximity switch. [6]

(*b*) Explain with diagram, three basic methods of detection used for capacitive sensors. [6]

5. (*a*) Explain how a photo diode can be used for measurement of light intensity. Support your answer with signal conditioning scheme. [7]

(*b*) Explain principle of optical pyrometer with neat block diagram. [6]

Or

6. (*a*) Explain signal conditioning technique used for optical proximity switch. What is the advantage of using modulated beam for it ? [7]

(*b*) Explain how clock and direction information is extracted from signal conditioner of incremental encoder. [6]

7. (*a*) How does an ultrasonic sensor detect level of a liquid in a tank ? Explain with timing diagram. [7]

(*b*) Explain principle of signal conditioning scheme for conductivity meter. [6]

Or

8. (*a*) Derive relation between flow of liquid and speed of rotor in a Turbine flow meter. How does the signal condition ? [7]

(*b*) What is piezo electric effect ? What is the function of charge amplifier ? Explain with diagram. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-156

S.E. (Instrumentation and Control) (II Sem.) EXAMINATION, 2017

ELECTRONIC INSTRUMENTATION

(2012 COURSE)

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 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*) Explain the working of Digital multimeter (DMM) with neat block diagram. [6]

(*b*) In ramp wave generator, constant current of magnitude 2 mA is used to charge capacitor of 0.1 μF, how much voltage will be developed across the capacitor after 2 mS. [6]

Or

2. (*a*) What is the resolution of 3½, 4½ and 5½ digit display. [6]

(*b*) Write short notes on : [6]

(*i*) PMU

(*ii*) PE.

P.T.O.

3. (*a*) Explain the significance of the following terms in Digital Storage Oscilloscope : [6]

(*i*) Bandwidth

(*ii*) Post trigger mode

(*iii*) Zoom.

(*b*) Explain the following terms related with signal converters : [6]

(*i*) Accuracy

(*ii*) Monotonocity

(*iii*) Quantization error.

Or

4. (*a*) Explain any *two* sweep modes used in dual trace oscilloscope. [6]

(*b*) Explain the working of R-2R ladder type DAC with neat diagram. [6]

5. (*a*) Compare frequency division multiplexing (FDM) with Time Division Multiplexing (TDM). [6]

(*b*) What is meant by virtual instrumentation ? Describe the importance of Lab view with example. [7]

Or

6. (*a*) Explain Amplitude Shift Keying (ASK) method using Coherent detector. [7]

(*b*) Write short notes on : [6]

(*i*) Frequency Modulation

(*ii*) Telemetry.

7. (*a*) List out types of wave analyzer. Explain working of any *one* type with neat block diagram. [7]

(*b*) Explain working of Swept Superheterodyne Spectrum Analyzer with neat block diagram. [6]

Or

8. (*a*) Explain working of Distortion analyzer with neat block diagram. [7]

(*b*) Explain working of Swept TRF Spectrum Analyzer with neat block diagram. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-157

S.E. (Instrumentation & 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.

1. (*a*) Determine overall transfer function of the system as shown in Fig. 1 [6]

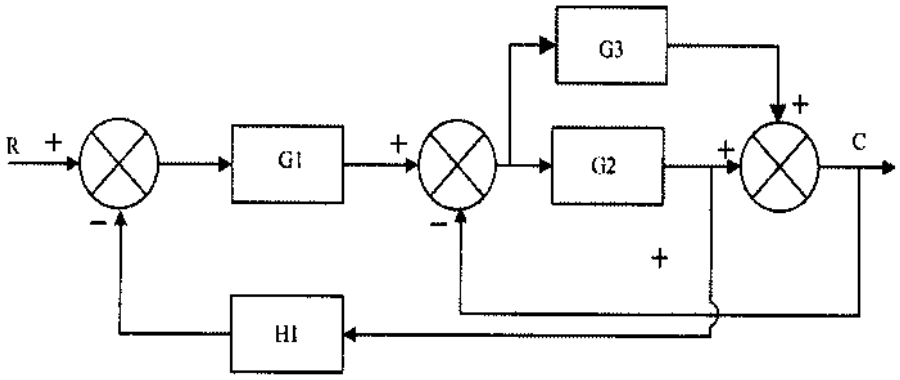


Fig. 1.

(*b*) What is control system ? Explain the different types of control system with suitable example. [6]

P.T.O.

Or

2. (*a*) Find the transfer function of the control system given by its signal flow graph as shown in Fig. 2. [6]

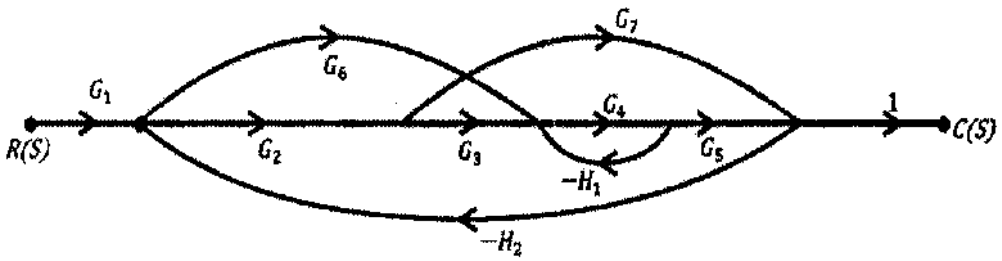


Fig. 2.

(*b*) For mechanical system shown in Fig. 3. write system equation at balance condition. Draw voltage and current analogous circuit. [6]

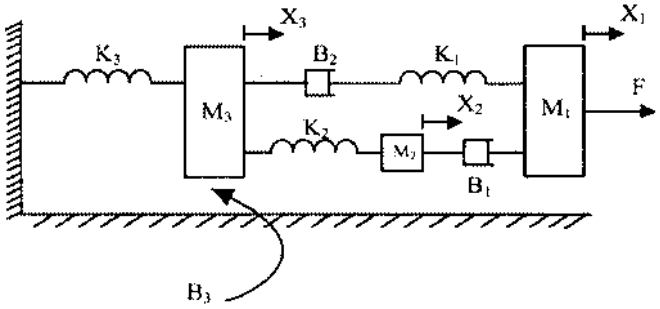


Fig. 3.

3. (*a*) Define the following systems and sketch its output waveform for a unit step input. [6]

(*i*) Underdamped system

(*ii*) Undamped system

(*iii*) Overdamped system

(*iv*) Critically damped system

(*b*) For a unity feedback system

$$G(s) = \frac{100(s+5)}{s^2(s+2)(s+6)}$$

Find :

(*i*) The type of the system

(*ii*) Error coefficients and

(*iii*) Steady state error for input $1 + 7t + \frac{t^2}{2}$. [6]

Or

4. (*a*) Define the following terms : [4]

(*i*) Stable system

(*ii*) Unstable system

(*iii*) Marginally stable system

(*iv*) Conditionally stable systems

(*b*) Sketch the complete root locus of system having : [8]

$$G(s)\ H(s) = \frac{K}{s(s+1)(s+2)(s+3)}.$$

5. (a) Write correlation between time domain and frequency domain specifications. [4]

(*b*) A feedback control system has

$$G(s)\ H(s) = \frac{100(s+4)}{s(s+0.5)(s+10)}.$$

Draw the Bode Plot and comment on the stability. [9]

Or

6. (*a*) Define : [5]

(*i*) Bandwidth

(*ii*) Phase margin

(*iii*) Gain margin

(*iv*) Gain crossover frequency

(*v*) Phase crossover frequency.

(*b*) A unity feedback control system has

$$G(s) = \frac{20}{s(1+0.1s)(1+0.01s)}$$

and H (*s*) = 1.
Draw the Bode Plot and comment on the stability. [8]

7. (*a*) Write a short note on mapping theorem. [5]

(*b*) Draw the polar plot for $G(s) = \frac{10s}{(s+1)(s+5)}$. [8]

Or

8. (*a*) How to obtain G.M. and P.M. from polar plot ? [5]

(*b*) Sketch the nature of the Nyquist plot for the system with

$$G(s)\ H(s) = \frac{5}{s(1+0.5s)}.$$

Determine gain margin. [8]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-158

S.E. (Instrumentation and Control)

EXAMINATION, 2017

DIGITAL TECHNIQUES

(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 calculator is allowed.

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

1. (*a*) Convert the following : [6]

(*i*) $(77466)_8$ to hexadecimal number

(*ii*) $(BACF9)_{16}$ to binary number

(*iii*) $(11001111011110110111)_2$ to hexadecimal number

(*b*) Compare TTL and CMOS circuit. [6]

Or

2. (*a*) Convert the following : [6]

(*i*) $(2AC5.D)_{16}$ to decimal number

P.T.O.

(*ii*) $(22.64)_{10}$ to hexadecimal number

(*iii*) $(725.63)_8$ to binary number.

(*b*) Compare totem-pole and open collector. [6]

3. (*a*) Design and implement a circuit for a code Gray to binary. [6]

(*b*) Implement the following using 8 : 1 multiplexer : [6]

$F(A, B, C, D) = \Sigma m(0, 2, 6, 10, 11, 12, 13) + d(3, 8, 14)$

Or

4. (*a*) Design and implement a circuit to Convert J-K to T flip-flop. [6]

(*b*) Implement

$$f(A, B, C) = \Sigma m(1, 3, 5, 6)$$

using 4 : 1 multiplexer. [6]

5. (*a*) Design PROM for 3-bit binary to Ex-3 code. [8]

(*b*) Explain the PROM with neat diagram. [5]

Or

6. (*a*) Compare ASIC and PLD approach. [8]

(*b*) Explain PLA with neat diagram. [5]

7. (*a*) Write short note on digital clock. [8]

(*b*) Write short note on RAM. [5]

Or

8. (*a*) Write short note on frequency counter. [8]

(*b*) Write short note on ROM. [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[5152]-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. 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*) 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 half bridge inverter. Draw waveforms. [6]

Or

2. (*a*) Explain the single phase full wave controlled rectifier with RL load. Draw the waveforms. [6]

(*b*) Explain with neat circuit diagram John's chopper. [6]

P.T.O.

3. (*a*) Derive the EMF equation of DC Generator. [7]

(*b*) Why is starter necessary for induction motor ? [6]

Or

4. (*a*) Explain armature controlled method of dc shunt motors speed control. [7]

(*b*) Explain with neat diagram torque-slip characteristics of induction motor. [6]

5. (*a*) Explain the working principle and construction of single phase induction motors. [6]

(*b*) Write a short note on synchronous motors. [6]

Or

6. (*a*) Explain with neat diagram the working principle of alternators. [6]

(*b*) Explain universal motor in detail. [6]

7. (*a*) Explain construction and working principle of stepper motor. [7]

(*b*) Classify the servomotors. Explain the A.C. servomotors. [6]

Or

8. (*a*) Classify the stepper motors. Explain any *one* in detail. [7]

(*b*) With a neat diagram explain the characteristics of Universal Motor. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**6**

Seat No.	

[5152]-161

S.E. (Computer Engg.) EXAMINATION, 2017

DISCRETE STRUCTURES

(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*) Neat diagrams must be drawn wherever necessary.

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

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

1. (*a*) Use mathematical induction to show that : [4]

$$P(n) = 1 + 4 + 7 + ... + (3n - 2) = \frac{n(3n-1)}{2}.$$

(*b*) Let [3]

$$A = \{a, b, \{a, c\}, \phi\}$$

determine the following sets :

(*i*) $A - \{a\}$

(*ii*) $A - \phi$

(*iii*) $A - \{a, c\}$.

P.T.O.

(*c*) Find the transitive closure of the relation R on : [5]

A = {1, 2, 3, 4} defined by

R = {(1, 2), (1, 3), (1, 4), (2, 1), (2, 3), (3, 4), (3, 2), (4, 2), (4, 3)}

Or

2. (*a*) Consider a set of integers from 1 to 250. Find how many of these numbers are divisible by 3 or 5 or 7 ? Also indicate how many are divisible by 3 or 5 but not by 7. [6]

(*b*) Prove that : [2]

$$P \leftrightarrow Q = (P \rightarrow Q) \wedge (Q \rightarrow P) = (\sim P \vee Q) \wedge (\sim Q \vee P).$$

(*c*) Draw the Hasse diagram of the following sets under the partial ordering relation 'divides' and indicate those which are chains. [4]

(*i*) {2, 4, 12, 24}

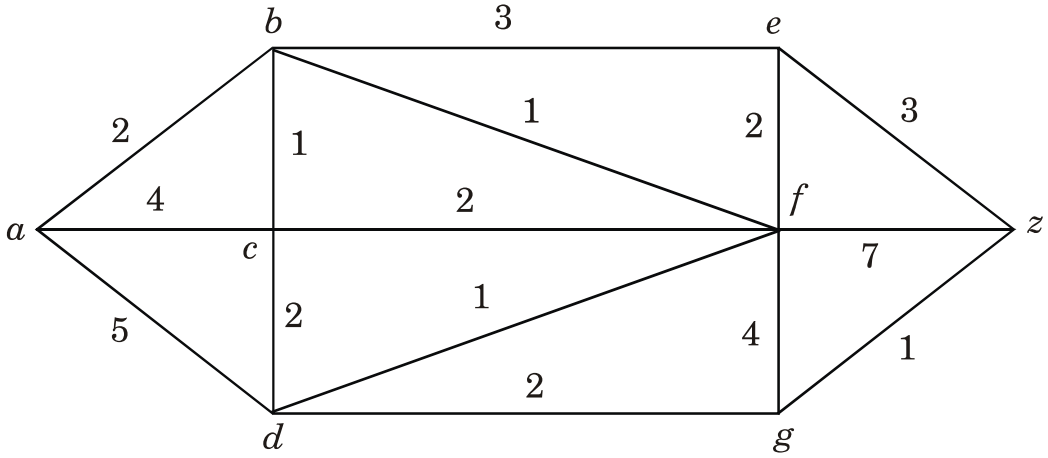
(*ii*) {1, 3, 5, 15, 30}.

3. (*a*) Consider the binary operation * on Q, the set of rational numbers other than 1 with operation * defined by : [6]

$$a * b = a + b - ab, \ \forall a, b \in Q$$

is an abelian group.

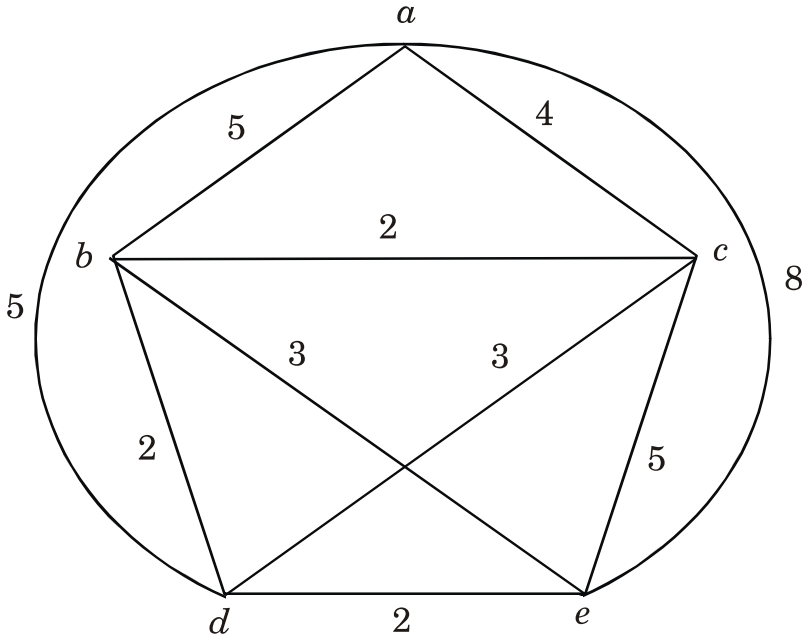
(*b*) Use Dijkstra's algorithm to find the shortest path between *a* and *z*. [6]



Or

4. (*a*) Prove that (R, +, *) is a ring with zero divisors, where R is 2* 2 matrix and + and * are usual addition and multiplication operations. [6]

(*b*) Use nearest neighbour method to find the Hamiltonian circuit starting from '*a*' in the following graph, find its weight. [6]



5. (*a*) Define the following terms with example : [6]

(*i*) Level and Height of a Tree

(*ii*) Eccentricity of Vertex

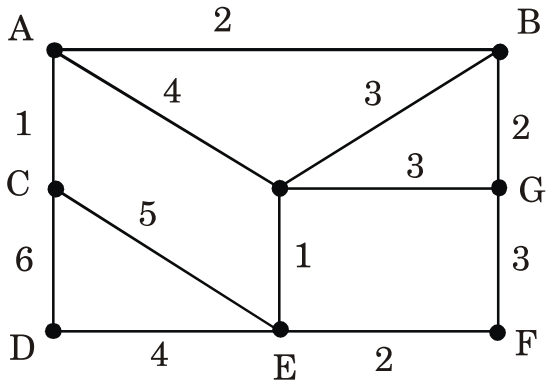
(*iii*) Rooted Tree and Binary Tree.

(*b*) For the following sets of weights, construct an optimal binary prefix code for each weight in the set, give the corresponding code word : [7]

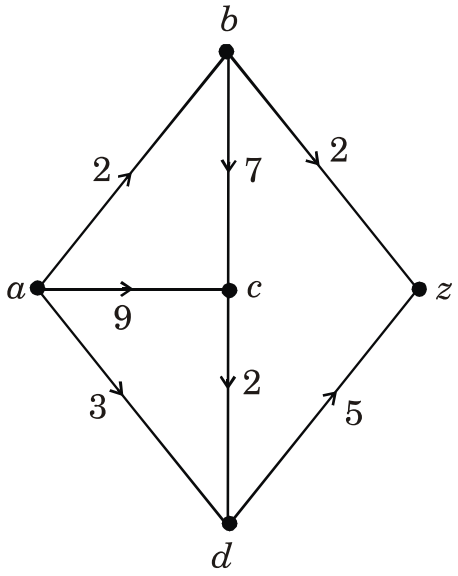
20, 75, 20, 85, 51, 32, 26, 19, 25, 30, 24, 29, 35, 37

Or

6. (*a*) Give the stepwise construction of minimum spanning tree using Prims algorithm for the following graph. Obtain the total cost of minimum spanning tree. [6]



(*b*) Determine the maximal flow in the following transport network. [7]



7. (*a*) (*i*) In how many different ways can letters of the word 'SIGNATURE' be arranged so that vowels always come together.

(*ii*) In how many ways can 21 books on English and 19 books on Hindi be placed in a row on a shelf so that two books on hindi many not be together. [6]

(*b*) One card is drawn from a pack of 52 cards :

(*i*) What is the probability that the card drawn is either a red card or a king ?

(*ii*) What is the probability that will be a diamond or a king ?

(*iii*) What is the probability that the card drawn is a face card ? [7]

Or

8. (*a*) If two dice are thrown, what is the probability of getting : [6]

(*i*) a doublet ?

(*ii*) total of 10 or 11 ?

(*b*) In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there ? [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-162

S.E. (Computer Engineering) (First Semester)

EXAMINATION, 2017

DATA STRUCTURES AND PROBLEM SOLVING

(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 calculator is allowed.

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

1. (*a*) Write pseudo C/C++ code for Quick sort. [4]

(*b*) Write the frequency count for the following code : [4]

```
for(i=0;i<n;i++)
{
for(j=0;j<n;j++)
{
c[i][j] = a[i][j] + b[i][j];
}
}
```

(*c*) What is the difference between Binary tree and Binary Search Tree ? Draw binary search tree for the following data : [4]

50, 25, 100, 17, 36, 65, 120, 104

P.T.O.

Or

2. (*a*) Sort the following data using merge soft in ascending order : [4]

14, 33, 27, 12, 37, 20, 42, 44.

(*b*) Write pseudo C/C++ code for inorder, preorder and postorder traversal of binary tree. [4]

(c) What is ADT ? Write ADT for Stack. [4]

3. (*a*) Explain various Graph storage structures. [6]

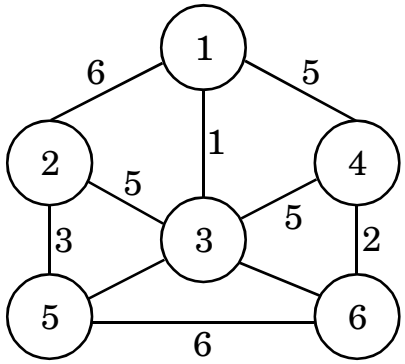
(*b*) Create AVL tree for the following data. Show all the rotations. [6]

9, 27, 50, 15, 2, 21, 36.

Or

4. (*a*) What is collision with respect to Hashing ? Explain various collision resolution techniques. [6]

(*b*) Find Minimun Spanning Tree for the following graph using Prim's algorithm. [4]



(*c*) What are the characteristics of a good hashing function ? [2]

5. (*a*) Construct 5-way binary tree for the following data : [7]

78, 21, 14, 11, 97, 85, 74, 63, 15, 42, 57, 20, 16, 19.

(*b*) Write notes on the following : [6]

(*i*) Sequential File

(*ii*) Random access file.

Or

6. (*a*) Sort the following data in ascending order using heap sort. [6]

15, 19, 10, 7, 17, 16

(*b*) What is a B tree ? Give the structure of its node. [3]

(*c*) What is sequential file ? Explain various operations that can be performed on sequential file. [4]

7. (*a*) Explain various models for parallel computation. [7]

(*b*) Write a parallel algorithm for odd-even merge sort. [6]

Or

8. (*a*) Write a parallel algorithm to perform addition of given numbers using complete binary tree method. [7]

(*b*) With an example explain pointer doubling problem. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-163

S.E. (Computer Engineering)

(First Semester) EXAMINATION, 2017

DIGITAL ELECTRONICS AND LOGIC DESIGN

(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*) Figures to the right indicate full marks.

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

1. (*a*) Do the required conversions for the following numbers. [6]

(*i*) $(310.56)_{10}$ = ($)_2$

(*ii*) $(5462)_8$ = ($)_{16}$

(*iii*) $(6516)_{10}$ = ($)_{16}$

(*b*) Define the following terms for TTL family : [2]

(*i*) Power dissipation

(*ii*) Speed of Operation.

(*c*) Explain two input CMOS NOR gate with neat diagram. [4]

Or

2. (*a*) Minimize the following functions using K-map and realize using logic gates.

$$F(A,B,C,D) = \sum m\ (1,\ 5,\ 7,\ 9,\ 11)$$ [4]

(*b*) Perform the following operation using 2's complement method $(35)_{10} - (18)_{10}$ = (?). [2]

P.T.O.

(*c*) Explain the working of three input TTL NAND gate with Totem pole output. [6]

3. (*a*) Implement the following function using 4 : 1 multiplexer

$F(A,B,C,D) = \sum m\ (1,\ 3,\ 7,\ 9,\ 11,\ 14,\ 15)$ [4]

(*b*) Convert the following Gray code numbers to Binary : [2]

(*i*) $(101101)_2$

(*ii*) $(111111)_2$

(*c*) What are the applications of FLIP- FLOPS ? Explain the working of JK Flip-Flop. [6]

Or

4. (*a*) Design four bit binary to gray code converter. Use logic gates as per your design and requirement. [6]

(*b*) Design MOD 78 counter by using IC 7490 [6]

5. (*a*) What is VHDL ? Explain different modelling styles of VHDL with suitable example. [7]

(*b*) What is ASM chart ? Explain components of ASM chart. What are applications of ASM chart in digital system design ? [6]

Or

6. (*a*) Draw an ASM chart and state table for 3-bit Up counter having control input E : [7]

(*i*) If control input E = 0 : Counter remains in same state.

(*ii*) If control input E = 1 : Counter goes to next state.

(*b*) What is difference between signal and variable in VHDL ? Explain with an example. [6]

7. (*a*) Draw and explain the basic architecture of FPGA. [6]

(*b*) A combinational circuits is defined by the functions : [7]

$$F1\ (A,B,C) = \sum m\ (0,\ 2,\ 5,\ 7)$$

$$F2\ (A,B,C) = \sum m\ (0,\ 1,\ 6,\ 7)$$

Implement this circuit with PLA.

Or

8. (*a*) What is PLA ? Explain input buffer, AND and OR matrix in PLA. [7]

(*b*) What is CPLD ? Give the difference between CPLD and FPGA. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-165

S.E. (Computer Engg.) (First Semester) EXAMINATION, 2017

MICROPROCESSOR ARCHITECTURE

(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 indicate full marks.

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

1. (*a*) Explain the test registers with their format. [3]

(*b*) Differentiate between Min mode and Max mode of 8086 processor [4]

(c) Explain the following pins of 8086 : [6]

(*i*) INTA#

(*ii*) HLDA

(*iii*) DT/R#

Or

2. (*a*) Specify size and function of IDTR. [3]

(*b*) Explain the hardware interrupt pins of 80386 processor. [4]

(*c*) Draw and explain the functional pin diagram of 80386 DX processor. [6]

3. (*a*) Draw and explain non-pipelined write cycle of 80386 DX. [5]

(*b*) Explain HOLD/HLDA signal. [4]

P.T.O.

(*c*) Explain with example difference between SUB and SBB instruction. [3]

Or

4. (*a*) Explain the following instructions : [5]

(*i*) XOR

(*ii*) TEST

(*iii*) WAIT

(*iv*) STD

(*v*) SHLD.

(*b*) What do you mean by assembler directives ? Explain any *three* assembler directives used in 80386 programming. [4]

(*c*) Explain the assembly language programming steps. [3]

5. (*a*) Explain in detail multiprocessor architecture. [6]

(*b*) Give the parallel programming with diagram. [4]

(*c*) Briefly explain hybrid multicore architecture. [3]

Or

6. (*a*) Draw and explain the block diagram of 64-bit architecture. [6]

(*b*) Write a short note on multicore application design and implementation. [4]

(*c*) Explain front side and black side bus. [3]

7. (*a*) Explain the IA-32 basic execution environment. [5]

(*b*) State the two sub-modes of IA-32e mode. [4]

(*c*) What are the advantages of hyper threading technology ? [3]

Or

8. (*a*) Explain in detail microarchitecture code name Nehalem. [5]

(*b*) List the features of SSE2 extensions in Pentium 4 and Intel Xeon processor. [4]

(*c*) Explain the features of Virtualization Technology. [3]

Total No. of Questions—**8**] [Total No. of Printed Pages—**5**

Seat No.	

[5152]-166

S.E. (Comp./IT) (II Semester) EXAMINATION, 2017

ENGINEERING MATHEMATICS—III

(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 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 :* [8]

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

(*ii*) $(D^2 - 4D + 4)y = 8x^2e^{2x} \sin x$

(*iii*) $(D^2 + 9)y = \dfrac{1}{1 + \sin 3x}$.

(*b*) Find the Fourier sine transform of $f(x) = \dfrac{e^{-ax}}{x}$. [4]

P.T.O.

Or

2. (*a*) An e.m.f. E sin *pt* is applied at $t = 0$ to a circuit containing a condenser C and inductance L in series the current I satisfies the equation : [4]

$$L\frac{dI}{dt} + \frac{1}{C}\int I\, dt = E \sin pt, \text{ where}$$

$$i = -\frac{dq}{dt}, \text{ If } p^2 = \frac{1}{LC}$$

and initially the current and the charge are zero, find current at any time t.

(*b*) Find the inverse z-transform (any *one*) : [4]

(*i*) $F(z) = \dfrac{z}{(z-1)(z-2)}, |z| > 2$

(*ii*) $F(z) = \dfrac{1}{(z-2)(z-3)}, 2 < |z| < 3$

(*c*) Solve the following differnece equation to find $f(k)$: [4]

$$6f(k+2) - 5f(k+1) + f(k) = 0$$

$$f(0) = 0, f(1) = 3, k \geq 0.$$

3. (*a*) The first four moments of a distribution about 25 are –1.1, 89, –110 and 23300. Calculate the first four moments about the mean. [4]

(*b*) In a Poisson distribution if : [4]

$$P(r = 1) = 2\ P(r = 2)$$

then show that :

$$P(r = 3) = 0.0613.$$

(*c*) Find the directional derivative of $\phi = 4xz^3 - 3x^2y^2z$ at (2, –1, 2) towards the point $\bar{i} + \bar{j} - \bar{k}$. [4]

Or

4. (*a*) Attempt any *one* : [4]

(*i*) For scalar functions ϕ and ψ, show that :

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

(*ii*) Show that :

$$\nabla^2\left(\frac{\bar{a}\,.\,\bar{b}}{r}\right) = 0.$$

(*b*) Show that the vector field :

$$\bar{F} = (ye^{xy}\cos z)\,\bar{i} + (xe^{xy}\cos z)\,\bar{j} + (-e^{-xy}\sin z)\bar{k}$$

is irrotational. Also find the corresponding scalar ϕ, such that $\bar{F} = \nabla\phi$. [4]

(*c*) If the two lines of regression are $9x + y - \lambda = 0$ and $4x + y - \mu = 0$ and the means of x and y are 2 and –3 respectively, then find λ, μ and the coefficient of correlation between x and y. [4]

5. (*a*) Apply Green's Lemma to evaluate the : [5]

$$\int (3x^2 - 8y^2)\,dx + (4y - 6xy)\,dy,$$

where C is the boundary of the region defined by $y = \sqrt{x}$, $y = x^2$ in the plane $z = 0$.

(*b*) If : [4]

$$\bar{F} = (x^2 + y - 4)i + 3xy\hat{j} + (2xz + z^2)\hat{k},$$

evaluate :

$$\iint_S (\nabla \times \bar{F}) \cdot \hat{n}\, dS,$$

where S is the surface of the sphere :

$$x^2 + y^2 + z^2 = 16$$

above the xy plane.

(*c*) Evaluate : [4]

$$\iint_S \bar{F} \cdot \hat{n}\, dS,$$

where

$$\bar{F} = (2x + 3y^2z^2)i - (x^2z^2 + y)\hat{j} + (y^3 + 2z)\hat{k}$$

and S is the surface of the sphere with centre (3, –1, 2) and radius 3.

Or

6. (*a*) Evaluate $\int_C \bar{F} . d\bar{r}$ from the point (0, 0, 0) to (1, 1, 1) along the curve $x = t$, $y = t^2$, $z = t^3$, given : [4]

$$\bar{F} = xy\hat{i} - z^2\hat{j} + xyzk.$$

(*b*) Using divergence theorem, evaluate $\int_S \bar{F} \cdot \hat{n}\, dS$, over S, the surface of unit cube bounded by the co-ordinates planes and the planes $x = 1$, $y = 1$ and $z = 1$ where $\bar{F} = 2xi + 3y\hat{j} + 4z\hat{k}$. [4]

(*c*) Apply Stokes' theorem to evaluate $\int_C \bar{F} . d\bar{r}$, where $\bar{F} = y\hat{i} + zj + x\hat{k}$, where C is the curve given by : [5]

$$x^2 + y^2 + z^2 - 2ax - 2ay = 0$$

and

$$x + y = 2a.$$

7. (*a*) If $v = 4xy(x^2 - y^2)$, find u such that $f(z) = u + iv$ is analytic and determine $f(z)$ in terms of z. [4]

(*b*) Evaluate $\int_C \tan z \, dz$ where C is the circle $|z| = 2$. [5]

(*c*) Show that the transformation $W = \frac{1}{z}$ maps the circle $x^2 + y^2 - 6x = 0$ onto a straight line in W-plane. [4]

Or

8. (*a*) If $f(z) = u + iv$ is analytic and $u + v = \sin x \cdot \cosh y + \cos x \cdot \sinh y$, then find $f(z)$ is terms of z. [4]

(*b*) Evaluate $\int \frac{e^z}{(z-1)^2 (z-2)} dz$ where 'C' is the contour $|z - 2| = \frac{3}{2}$ by using Cauchy's residue theorem. [5]

(*c*) Find the bilinear transformation which maps the points $0, \frac{1}{2}, 1 + i$ from z-plane into the points $-4, \infty, 2 - 2i$. [4]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-167

S.E. (Comp.) (II Sem.) EXAMINATION, 2017

OBJECT ORIENTED AND MULTICORE PROGRAMMING

(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** *or* 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*) Define the terms : [8]

(*i*) Member Access Control

(*ii*) RTTI

(*iii*) Constructor and Destructor

(*iv*) Static member function.

(*b*) Explain the virtual base class with suitable example. [4]

Or

2. (*a*) Explain the following terms : [9]

(*i*) Generic programming

(*ii*) New and delete keyword

(*iii*) Pure virtual function.

(*b*) Explain the concept of copy constructor in detail. [3]

P.T.O.

3. (*a*) What is a scope resolution operator ? Explain with suitable example. [4]

(*b*) Explain the free store operators and memory management operators. [4]

(*c*) What do you mean by dynamic initialization of variables ? Explain with example. [4]

Or

4. (*a*) Explain with suitable example, call by value and call by reference. [8]

(*b*) How to handle multiple exceptions occurred in a program ? [4]

5. (*a*) Explain difference between function overloading and function template. [6]

(*b*) Explain STL in detail with its components. [6]

Or

6. (*a*) Explain try-catch-throw-rethrow in detail with example. [6]

(*b*) Distinguish between error and exception [3]

(*c*) Explain any *two* unformatted I/O functions. [3]

7. (*a*) Explain threads in terms of creating, compiling and linking. [6]

(*b*) Explain concept of setting thread and scheduling and priorities. [4]

(*c*) What are thread interface classes ? Give example. [4]

Or

8. (*a*) Explain with suitable diagram, decomposition of tasks in multiprocessing environment. [8]

(*b*) Explain sequential and concurrency models. [3]

(*c*) Explain message queue and semaphore. [3]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-169

S.E. (Computer Engineering) (Second Semester)

EXAMINATION, 2017

COMPUTER GRAPHICS AND GAMING

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Answer total *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 diagrams must be drawn wherever necessary.

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

1. (*a*) Write Bresenham's line drawing algorithm. [6]

(*b*) Explain any *three* character generation methods. [6]

Or

2. (*a*) Write Bresenham's circle drawing algorithm. [8]

(*b*) Define the following terms : [4]

(1) Raster Scan Display

(2) Frame Buffer

3. (*a*) Write matrices for 3-D object Scaling, Rotation about X-axis, Rotation about Y-axis. [6]

P.T.O.

(*b*) Write and explain scan line algorithm for polygon filling. [6]

Or

4. (*a*) What is inside test ? Write significance of it. Explain winding number method for inside test. [6]

(*b*) Derive matrix for rotation about arbitrary point. Also rotate point (3, 3) with respect to (1, 1) by 90 degree. [6]

5. (*a*) Explain RGB and HIS color model. [6]

(*b*) Write short notes on the following back face removal algorithm. [4]

(*i*) Painter's algorithm

(*ii*) Z–buffer

(*c*) Explain point source illumination and diffused illumination. [3]

Or

6. (*a*) Enlist and explain any *two* color models. [4]

(*b*) Write short notes on : [9]

(*i*) Bezier Curve

(*ii*) B-splines

(*iii*) Transparency

7. (*a*) Explain significance of NVIDIA workstation in gamming. [4]

(*b*) Explain the features of computer graphics and animation software. [4]

(*c*) Explain a segment table with an example along with data structure used to implement are segment table ? [5]

Or

8. (*a*) Write any *two* algorithms for segment operation. [6]

(*b*) Explain methods of controlling animation. [3]

(*c*) Compare and contrast conventional and computer based animation. [4]

Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[5152]-170

S.E. (Comp. Engg.) 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** and 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*) Explain the role of the following registers in processor : [6]

(*i*) Program Counter

(*ii*) Accumulator

(*iii*) Stack Pointer.

Or

2. (*a*) Differentiate between microprocessor, microcontroller and parallel processing. [6]

(*b*) Explain the communication between processor and coprocessor. [6]

3. (*a*) Explain non-restoring division algorithm with flowchart. [6]

P.T.O.

(*b*) Explain in detail hazards in instruction pipeline. What is operand forwarding ? [6]

Or

4. (*a*) Perform 1100 ÷ 11 using restoring division algorithm. [6]

(*b*) Draw and explain single bus organization of CPU. [6]

5. (*a*) Compare UMA and NUMA architecture. [6]

(*b*) Explain use of DMA controller in computer system. [7]

Or

6. (*a*) Write a note on memory mapped I/O and I/O mapped I/O with advantages and disadvantages. [6]

(*b*) Explain direct and set associative cache mapping techniques along with their merits and demerits. [7]

7. (*a*) Draw and explain architectural block diagram of IBM cell broadband engine. Write application of it. [7]

(*b*) Explain IA-64 architecture. [6]

Or

8. (*a*) Compare traditional superscalar architecture and IA-64 architecture. [7]

(*b*) Explain advantages and disadvantages of parallel processing. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**6**

Seat No.	

[5152]-171

S.E. (Information Technology) (Second Semester)

EXAMINATION, 2017

DISCRETE STRUCTURES

(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 calculator is allowed.

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

1. (*a*) Prove the statement is true by mathematical induction : [6]

$n^3 + 2n$ is divisible by 3 for all $n >= 1$.

(*b*) Find the transitive closure by using Warshall's algorithm for the given relation as : [6]

R = {(1, 2), (2, 1), (2, 3), (3, 4)}

P.T.O.

Or

2. (*a*) Solve the following recurrence relation : [6]

$$a_n - 7a_{n-1} + 10a_{n-2} = 0,\ a_0 = 0,\ a_1 = 3\,.$$

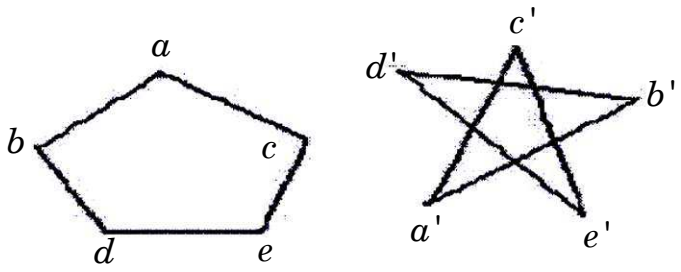
(*b*) In a group of 70 cars tested by a garage in a city, 15 had faulty tyres, 20 had faulty brakes and 18 exceed the allowable emission limits. Also 5 cars had faulty tyres and brakes, 6 failed on tyres and emission, 10 failed on brakes and emission and 4 cars were unsatisfactory in all three aspects. How many had no faults in these three checks ? Draw an appropriate Venn diagram. [6]

3. (*a*) Determine whether the set together with binary operation is a group. If it is group, determine if it is abelian, specify the identity and inverse. [6]

(*i*) The set of odd integers under operation of multiplication.

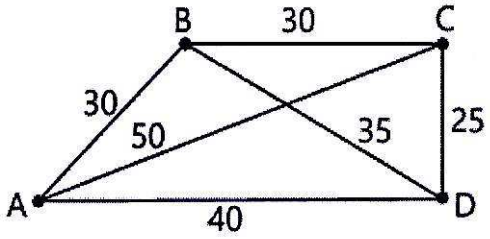
(*ii*) Q, the set of all rational numbers under operation of addition.

(*b*) Determine graph G and H shown in figure are isomorphic or not ? Justify your answer. [6]

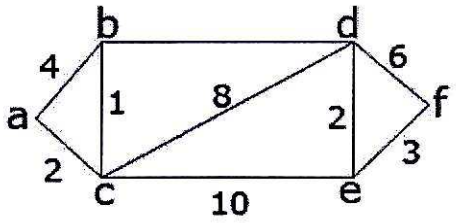


Or

4. (*a*) Find the Hamiltonian circuit using nearest neighbor method starting in A vertex. [6]



(*b*) Find the shortest path using Dijikstra's algorithm for the given graphs. The source node is a and destination node f. [6]

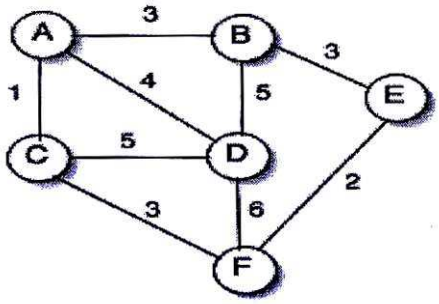


5. (*a*) Construct an optimal binary tree for the set of weights as : [6]

{8, 9, 10, 11, 13, 15, 22}.

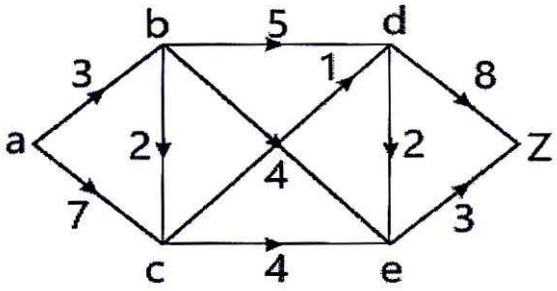
Find the weight of an optimal tree. Also assign the prefix codes and write the code words.

(*b*) Find the Minimum spanning tree and weight of it for the given graph using Kruskal's algorithm. [7]

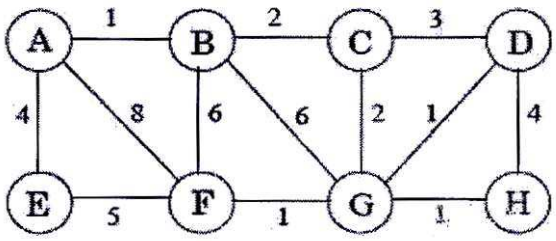


Or

6. (*a*) Find the maximum flow for the following transport network. [6]



(*b*) Find the Minimum spanning tree and weight of it for the given graph using Prim's algorithm. [7]



7. (*a*) One card is drawn from a deck of 52 cards. If each outcome is equally likely, calculate the probability that the card will be : [6]

(*i*) a spade

(*ii*) a black card

(*iii*) not a spade.

(*b*) How many 3-digit number can be formed using the 2, 3 4, 5, 7 and 9, if the repenetition of digits is not allowed ? [7]

(*i*) How many of these numbers is less than 400 ?

(*ii*) How many are even ?

(*iii*) How many are multiples of 5 ?

(*iv*) How many are odd ?

(*v*) How many are multiple of 10 ?

Or

8. (*a*) Find the number of arrangements that can be made out of the letters : [6]

(*i*) INDEPENDENCE

(*ii*) BENZENE.

(*b*) Three students A, B and C are swimming in the race. A and B have same probability of winning and each is twice as likely to win as C. Find the probability that : [7]

(*i*) B wins

(*ii*) C wins

(*iii*) B or C wins.

Total No. ef Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-173

S.E.(I.T.) (First Semester) EXAMINATION, 2017

Digital Electronics and Logic Design

(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 not allowed.
(*iv*) Assume suitable data if necessary.

1. (*a*) Convert the decimal number 82.67 and 121.25 to its binary, hexadecimal and octal equivalents. [6]

(*b*) Explain any *three* IC characteristics and state their values for standard TTL and CMOS family. [6]

(1) Propagation Delay
(2) Noise Margin
(3) Fan-in and Fan-out
(4) Figure of Merit

Or

2. (*a*) Perform the following binary arithmetic's using 2's complement method :

(*i*) $(-20)_{10} + (25)_{10}$
(*ii*) $(+20)_{10} + (-25)_{10}$
(*iii*) $(-20)_{10} + (-25)_{10}$ [6]

(*b*) What do you mean by Half Adder and Full Adder ? How will you implement full adder using Half Adder ? Explain with circuit diagram. [6]

P.T.O.

3. (*a*) What do you mean by Master Slave JK Flip-Flop ? Explain the working of this Flip-Flop to eliminate race around condition. [6]

(*b*) Draw 4-bit ring and twisted ring counter. Draw state diagram for both assuming initial state as 1000. [7]

Or

4. (*a*) Convert JK Flip-Flop to T Flip-Flop and D Flip-Flop. Show all the design steps. [6]

(*b*) Draw an ASM chart and use multiplexer controller method to design 2-bit up/down counter having mode control input M such that when M = 1 : Up Counting & when M = 0 : Down Counting. The circuit should generate output 1 whenever count become minimum or maximum. [7]

5. (*a*) Draw the basic structure of FPGA. Explain its feature in brief. [6]

(*b*) Implement the following function using Programmable Logic Device.

$$F_1 = \sum m \ (0, 3, 4, 7)$$

$$F_2 = \sum m \ (1, 2, 5, 7)$$ [6]

Or

6. (*a*) Write any *two* comparisons between PROM, PLA and PAL. [6]

(*b*) Draw a PLA circuit to implement the logic function. [6]

$F_1 = X_1X_2 + X_1X_3' + X_1'X_2'X_3'$

$F_2 = X_1X_2 + X_1'X_2'X_3 + X_1X_3$

7. (*a*) Write VHDL description of D Flip-Flop with Asynchronous reset. [6]

(*b*) Describe different modeling styles of VHDL with suitable example. [7]

Or

8. (*a*) With the help of suitable example explain the data object :

(1) Signal

(2) Variable

(3) Constant [6]

(*b*) Write entity and architecture declaration of a 4 bit adder. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[5152]-175

S.E. (Information Technology) (First Semester)

EXAMINATION, 2017

PROBLEM SOLVING AND OBJECT ORIENTED PROGRAMMING

(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 diagram 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*) What are operators ? Explain different types of operators. Draw table for hierarchy of operator. [6]

Or

2. (*a*) What are the *three* types of decision logic ? Explain with flowchart. [6]

(*b*) Create the algorithm and the flowchart to find the average percentage (%) of all the students in a class using automatic counter loop. [6]

P.T.O.

3. (*a*) What are table lookup techniques ? Explain any *one* table lookup technique in detail. [6]

(*b*) Explain features of object oriented programming in detail. [6]

Or

4. (*a*) Write algorithm for keyword searching in text. [6]

(*b*) How is memory management carried out in C++ ? Write syntax for the same. [6]

5. (*a*) Explain need of function overloading. Write C++ program to demonstrate function overloading. [6]

(*b*) Explain multilevel inheritance with C++ program. [7]

Or

6. (*a*) What is pure virtual function ? [6]

(*b*) What is inheritance ? Explain types of inheritance. [7]

7. (*a*) Write a note on Standard Template Library. [6]

(*b*) What is use of Exception Handling in C++ ? [7]

Or

8. (*a*) Write a note on RTTI. [6]

(*b*) How to manage console I/O operations ? [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-176

S.E. (IT.) (Second Semester) EXAMINATION, 2017

COMPUTER GRAPHICS

(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 wherevery necessary.

(*iii*) Figures to the right side indicate full marks.

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

1. (*a*) Explain Mid-Point circle drawing Algorithm. [6]

(*b*) Find the transformation matrix that transforms the given square ABCD to half its size with center still remaining at same position. The co-ordinate of square are A(1,1) B(3,1) C(3,3) D(1,3) and center at (2,2). Also find resultant co-ordinate of square. [6]

Or

2. (*a*) Define : [6]

(*i*) Aliasing

(*ii*) Antialiasing

(*iii*) Phasing

P.T.O.

(*iv*) Display File

(*v*) Resolution

(*vi*) Persistence.

(*b*) Explain and write pseudo code for boundary fill algorithm for ploygon filling. [6]

3. (*a*) Find the normalization transformation window to viewport with window, lower left corner (1,1) and upper right corner at (3,5) onto a viewport for entire normalized device screen. [6]

(*b*) What are Parallel and Perspective Projection ? Explain with neat sketch 2-point and 3-point Perspective projection. [6]

Or

4. (*a*) Explain Cohen-Sutherland Line clipping with the help of suitable example. [6]

(*b*) Obtain 3-D transformation matrix for : [6]

(*i*) Translation

(*ii*) Scaling

(*iii*) Rotation about Z-Axis.

5. (*a*) What is shading ? Explain phong shading with its advantage and disadvantage. [7]

(*b*) Explain various methods to specify motion of object. [6]

Or

6. (*a*) (*i*) Write a note on key frame system. [4]

(*ii*) Define : [3]

(1) Complementary colour

(2) Colour gamut

(3) Primary colour.

(*b*) Explain HSV colour model. Write at least two comparisons between RGB and HSV. [6]

7. (*a*) Give Blending function for cubic Bezier Curve. Also write properties of Bezier curve. [7]

(*b*) Write short notes on : [6]

(*i*) Interpolating Polygon

(*ii*) Fractal Lines.

Or

8. (*a*) What are fractals ? How are fractals classified ? [7]

(*b*) Explain Bezier curve generation using Mid-Point Subdivision. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-177

S.E. (Information Technology) (Second Semester)

EXAMINATION, 2017

PROCESSOR ARCHITECTURE AND INTERFACING

(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*) Assume suitable data, if necessary.

1. (*a*) Explain the following bits of EF lag register in 80386 processor :

(*i*) IOPL

(*ii*) VM

(*iii*) TF. [6]

(*b*) Explain the assembler directives in 80386 programming :

(*i*) .model

(*ii*) .data. [6]

Or

2. (*a*) Draw the timing diagram of pipelined bus cycle for write operation in 80386. Show status of important signals. [6]

(*b*) State with examples any *six* addressing modes of 80386 processor. [6]

P.T.O.

3. (*a*) Explain with a neat diagram the page translation mechanism in 80386 protected mode. [7]

(*b*) What are privileged instructions in 80386 processor ? Explain any *two* privileged instructions. [6]

Or

4. (*a*) Explain the process of entering and leaving in virtual 8086 mode of 80386. [7]

(*b*) Explain with a neat diagram the interrupt Descriptor Table in 80386. [6]

5. (*a*) Draw and explain the internal memory organization of 8051. [6]

(*b*) Draw the functional architecture diagram of 8051 microcontroller. [6]

Or

6. (*a*) Explain the following instruction of 8051 : [6]

(*i*) ADD A, # 10

(*ii*) MUL AB

(*iii*) MOVC A, @ A + PC

(*b*) Compare the following instructions of 8051 : [6]

(*i*) RET and RETI

(*ii*) SJMP and AJMP.

7. (*a*) List the interrupts supported by 8051 with their vector addresses & default priorities. [7]

(*b*) Explain the TMOD & TCON SFR of 8051 microcontroller. [6]

Or

8. (*a*) Explain the following SFR of 8051 microcontroller :

(*i*) Program Status Word

(*ii*) PCON Register. [6]

(*b*) Explain Mode 1 and Mode 2 of serial communication in 8051 microcontroller. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5152]-182

S.E. (Chemical) (First 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.

1. (*a*) Explain with a graph the rheological behavior of Newtonian and non-Newtonian fluids. [7]

(*b*) Express pressure intensity of 50 m of water column into [6]

(*i*) Height of liquid of density 600 kg/m^3

(*ii*) Oil of specific weight 8 kN/m^3

Or

2. (*a*) Define the following terms : [6]

(*i*) Gauge Pressure

(*ii*) Absolute Pressure

(*iii*) Vacuum Pressure.

(*b*) What is fluid ? How are fluids classified ? [3]

(*c*) Find the kinematic viscosity of oil having density 981 kg/m^3 The shear stress at a point in oil is 0.2452 N/m^2 and velocity gradient at the point is 0.2 per second. [4]

P.T.O.

3. (*a*) Deduce Bernoulli's equation from Euler's equation and write the assumptions for Bernoulli's equation. [6]

(*b*) An orifice meter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50 cm of mercury. Find the rate of flow of oil of specific gravity 0.9 when the coefficient of discharge of the meter is 0.64. [6]

Or

4. (*a*) Derive Hagen-Poiseulli equation for steady laminar flow in pipes. State the assumptions made. [6]

(*b*) Draw a neat sketch and explain the working of Venturimeter [6]

5. (*a*) What is meant by boundary layer ? Define and write formulae for momentum and displacement thickness. [6]

(*b*) Differentiate between major and minor losses in pipes. When are minor losses significant ? Explain any *one* minor loss in detail. [6]

Or

6. (*a*) Define Buckingham's π-theorem. What are the criteria for selection of repeating variables ? [6]

(*b*) Calculate the momentum thickness for the following boundary layer velocity flow : [6]

$$\frac{u}{u_\infty} = \frac{3}{2}\left(\frac{y}{\delta}\right) - \frac{1}{2}\left(\frac{y}{\delta}\right)^3.$$

7. (*a*) Explain phenomenon of cavitation in pumps. How can it be prevented ? Explain meaning of the term NPSH. [7]

(*b*) Discuss the classification of the fluidization and describe any *one* in detail. [6]

Or

8. (*a*) Explain different types of drags acting on solid immersed in moving fluid. [5]

(*b*) What are different types of Valves ? Explain any *one* in detail. [5]

(*c*) What is priming ? Why is it necessary ? [3]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+1**

Seat No.	

[5152]-184

S.E. (Chemical Engineering) (First 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.

1. (*a*) Calculate the available nitrogen content of solution having 30% urea, 20% ammonium sulphate & 20% ammonium nitrate. [6]

(*b*) A single effect evaporator is fed with 10000 kg/hr of weak liquor containing 15% caustic by weight and is concentrated to get thick liquor containing 40% by weight caustic (NaOH). Calculate (a) kg/hr of water evaporated and (b) kg/hr of thick liquor obtained. [6]

Or

2. (*a*) An aqueous solution of K_2CO_3 is prepared by dissolving 43 kg of K_2CO_3 in 100 kg of water at 293K. Find Molarity, Normality & Molality of solution. Take density of solution 1.3 kg/L. [6]

P.T.O.

(*b*) It is desired to make up 1000 kg of solution containing 35% by weight of a substance 'A' two solutions are available, one containing 10 weight % 'A' and other containing 50 weight percent of 'A' how many kilogram of each solution required ? [6]

3. (*a*) In the shift reaction $CO + H_2O \rightarrow CO_2 + H_2$, *a* & *b* are mole % of CO in the inlet & dry outlet gas mixture to and from the reactor respectively. Prove that moles of CO converted (X) per 100 moles of inlet gas mixture can be calculated by using the formula :

$$X = \frac{a(100-b)}{100+b}$$ [6]

(*b*) Stream of carbon dioxide flowing at a rate of 100 kmol/min is heated from 298K (25°C) to 383 K (110°C). Calculate the heat that must be transferred using $C^0_{p.}$ data. [6]

DATA : $C_p^0 = a + bT + cT^2 + dT^3$. kJ/(kmol.K)

Gas	a	$b \times 10^3$	$c \times 10^6$	$d \times 10^9$
CO_2	21.3655	64.2841	–41.0506	9.7999

Or

4. (*a*) The gaseous reaction $A \rightarrow 2B + C$ takes place isothermally in a constant pressure reactor. Starting with a mixture of 75% A & 25% of inerts (both on Volume basis) in a specified

time the volume doubles. Compute the % conversion of A achieved. [6]

(*b*) Calculate the heat of formation of liquid ethyl acetate at 298 K (25°C) [6]

Data :

Standard heat of formation of CO_2 (*g*) = –393.51 kJ/mol

Standard heat of formation of H_2O (*l*) = –285.83 kJ/mol

Standard heat of combustion of liquid ethyl acetate $C_4H_8O_2$ = ΔH^O_c = –2230.91

5. (*a*) Define : [5]

(1) Dry Bulb Temperature

(2) Wet Bulb Temperature

(3) % Relative Humidity

(4) Dew Point

(5) Humid Heat.

(*b*) The crystallizer is fed with a saturated solution of $MgSO_4$ at 353 K (80° C). The mass is cooled to 303K (30°C) to obtained $MgSO_4.7H_2O$ crystals. During cooling, 4% solution is lost by evaporation of water. Calculate the quantity of saturated solution that should be fed to crystallizer in order to obtained 1000 kg of $MgSO_4.\ 7H_2O$ crystals. [8]

Data :

The solubility of $MgSO_4$ in water at 353 K = 64.2 kg $MgSO_4$/ 100 kg H_2O

The solubility of $MgSO_4$ in water at 303 K = 40.8 kg $MgSO_4$/ 100 kg H_2O

Or

6. (*a*) The dry bulb temp. and dew point of ambient air were found to be 300 K (29°C) and 291 K (18° C) respectively, barometer reads 100 kpa, calculate (*a*) absolute molal humidity (*b*) absolute humidity (*c*) % RH (*d*) % saturation (*e*) Humid Heat (*f*) Humid volume the relative saturation of 30%. [7]

Data : Vapour pressure of water at 291 K = 2.0624 kpa. Vapour pressure of water at 302 K = 4.004 Kpa.

(*b*) A gas mixture containing benzene vapors is saturated at 101.325 kpa and 323 K (50° C), calculate the absolute humidity if the other components of mixture is (*a*) Nitrogen and (*b*) carbon dioxide. [6]

Data : Vapour pressure of benzene at 323 K = 36.664 kpa

7. (*a*) Define calorific value, GCV, NCV. [3]

(*b*) (1) Explain different types of Fuels. [4]

(2) Calculate the net calorific value (NCV) at 298 K of a sample of fuel oil having C/H ratio 9.33 (by weight) & containing sulphur to the extent of 1.3% by weight. [6]

Data : The GCV of the fuel oil at 298K (25°C) = 41785 kJ/kg

Latent heat of water vapour at 298K (25°C) = 2442.5 kJ/kg

Or

8. (*a*) Write short note on Proximate analysis and Ultimate analysis of coal. [5]

(*b*) The Orsat analysis of the flue gases from a boiler house chimney by volume is as given below : [8]

CO_2 : 11.4%,O_2 : 4.2% & N_2 : 84.4%

Assuming the complete combustion takes place,

(1) Calculate the % excess air and

(2) Find the C : H ratio

Total No. of Questions—**8**] [Total No. of Printed Pages—**7**

Seat No.	

[5152]-185

S.E. (Chemical/Printing Engineering) (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*) Figures to the right indicate full marks.

(*iii*) Use of non-programmable calculator is allowed.

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

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

(*i*) $(D^2 + 3D + 2)y = e^{ex}$

(*ii*) $(D^3 + D)y = \sin x$

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

P.T.O.

(*b*) Solve the integral equation : [4]

$$\int_0^{\infty} f(x) \sin \lambda x \, dx = 1, \quad 0 \leq \lambda \leq 1$$

$$= 2, \quad 1 \leq \lambda \leq 2$$

$$= 0, \quad \lambda \geq 2$$

Or

2. (*a*) A body weighing W = 20 N is hung from a spring. A pull of 40 N will stretch the spring to 10 cm. The body is pulled down to 20 cm below the static equilibrium position and then released. Find the displacement of the body from its equilibrium position in time t seconds, the maximum velocity. [4]

(*b*) Find the Fourier cosine integral representation for the function : [4]

$$f(x) = x^2, \quad 0 < x < a$$

$$= 0, \quad x > a$$

(*c*) Find the function $f(x)$, if : [4]

$$F_S(\lambda) = \frac{1}{\lambda} e^{-a\lambda}$$

3. (*a*) Solve any *one* of the following : [4]

(*i*) Find Laplace transform of :

$$\int_0^t e^{-at} \left(\frac{\sin bt}{t} \right) dt .$$

(*ii*) Evaluate the integral

$$\int_0^\infty e^{-2t} t \sinh t \; dt$$

by using Laplace transform concept.

(*b*) Find inverse Laplace transform of : [4]

$$\frac{2s + 3}{s^2 + 6s + 25}.$$

(*c*) Find the directional derivative of [4]

$$\phi = 4xz^3 - 3x^2y^2z$$

at the point (2, –1, 3) in the direction of tangent to the curve

$$x = e^{-t},\ y = 2\sin t + 1,\ z = t - \cos t \text{ at } t = 0.$$

Or

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

(*i*) $\nabla\left(\bar{a} \,.\, \nabla \log r\right) = \frac{\bar{a}}{r^2} - \frac{2\left(\bar{a} \,.\, \bar{r}\right)\bar{r}}{r^4}$

(*ii*) $\nabla^2\left(\nabla \,.\, \frac{\bar{r}}{r^4}\right) = -\frac{12}{r^6}$.

(*b*) Show that the vector field $[f(r)\,\bar{r}\,]$ is irrotational. Also determine $f(r)$ if $[f(r)\,\bar{r}\,]$ is solenoidal. [4]

(*c*) Solve the integro differential equation by using Laplace transform method : [4]

$$\frac{dy}{dt} + 3y(t) + 2\int_0^t y(t)\, dt = 1,\ y(0) = 0.$$

5. (*a*) Find the work done in moving a particle once round the ellipse [4]

$$\frac{x^2}{25} + \frac{y^2}{16} = 1,\ z = 0$$

under the field of force given by :

$$\bar{F} = (2x - y + z)\bar{i} + (x + y - z^2)\bar{j} + (3x - 2y + 4z)\bar{k}\ .$$

(*b*) Evaluate : [5]

$$\iint \bar{F}\ .\ d\bar{s}\ ,$$

where

$$\bar{F} = y\bar{i} + x\bar{j} + z^2\bar{k}$$

for the cylindrical region

$$x^2 + y^2 = a^2,\ z = 0,\ z = b.$$

(*c*) Evaluate : [4]

$$\iint_S (\nabla \times \bar{F})\ .\ d\bar{s}\ ,$$

for the vector

$$\bar{F} = xy^2\bar{i} + y\bar{j} + xz^2\bar{k}$$

for the surface of rectangular Lamina bounded by :

$$x = 0,\ y = 0,\ x = 1,\ y = 2,\ z = 0.$$

Or

6. (*a*) Evaluate : [4]

$$\iint_C \bar{F} \cdot d\bar{r}$$

for

$$\bar{F} = 3x^2\bar{i} + (2xz - y)\bar{j} + z\bar{k},$$

along the straight line joining (0, 0, 0) to (2, 1, 3).

(*b*) Prove that : [4]

$$\iint_S (\phi\nabla\psi - \psi\nabla\phi).d\bar{S} = \iiint_V (\phi\nabla^2\psi - \psi\nabla^2\phi)dV$$

(*c*) Evaluate : [5]

$$\iint_S (\nabla \times \bar{F}) \cdot d\bar{S}$$

for

$$\bar{F} = y\bar{i} + z\bar{j} + x\bar{k}$$

'S' is the surface of the paraboloid

$$z = 1 - x^2 - y^2,\ z \geq 0.$$

7. (*a*) A tightly stretched string with fixed ends $x = 0$ and $x = l$ is initially at rest in its equilibrium position. If it is set vibrating giving each point a velocity $3x(l - x)$ for $0 < x < l$, find the displacement. [7]

(*b*) Solve : [6]

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

for the conduction of heat along a rod without radiation, subject to the following conditions :

(*i*) u is not infinite at $t \to \infty$

(*ii*) $\frac{\partial u}{\partial x} = 0$ for $x = 0$, $x = l$ and

(*iii*) $u = lx - x^2$ for $t = 0$ between $x = 0$, $x = l$.

Or

8. (*a*) An infinitely long plate 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 π. This end is maintained at temperature u_0 at all points and other edges at zero temperature. Find $u(x, y)$. [7]

(*b*) Use Fourier transform to solve : [6]

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, \quad 0 < x < \infty, \; t > 0$$

where $u(x, t)$ satisfies the conditions :

(*i*) $\left(\frac{\partial u}{\partial x}\right)_{x=0} = 0, \; t > 0$

(*ii*) $u(x, 0) = \begin{cases} x, & 0 < x < 1 \\ 0, & x > 1 \end{cases}$

(*iii*) $|u(x, t)| < \text{M}.$

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-187

S.E. (Chemical) (Second Semester) EXAMINATION, 2017

HEAT TRANSFER

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Neat diagram must be drawn wherever necessary.

(*ii*) Your answers will be valued as a whole.

(*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*) What are the modes of heat transfer ? Explain. [6]

(*b*) Derive an expression for the rate of heat transfer through composite plane wall considering of heterogeneous layers having thermal conductivities, K_1, K_2 and K_3 respectively ? [6]

Or

2. (*a*) Two faces of a 90 mm thick stainless steel plate are maintained at 350 ºC and 180ºC. How much heat is transfered through the plate per unit area, if the thermal conductivity of stainless steel is 16.3 W/(mK) ? [6]

(*b*) The 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.

P.T.O.

The inside temperature of the furnace is 1213K and the outside temperature is 318K. 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. [6]

3. (*a*) State and explain : [6]

(1) Fourier Law of heat conduction.

(2) Newton's Law of cooling

(3) Stefan Boltzmann's Law of radiation.

(*b*) What are Biot and Fourier's numbers ? Explain their physical significance. [6]

Or

4. (*a*) A 60 mm ID pipe at 423 K passes through a room in which the surroundings are at temperature of 300K. If the emissivity of the pipe is 0.8, what is the net interchange of radiation energy per meter length of pipe ? The outside diameter of pipe is 60mm. [6]

(*b*) Define the following terms :

(*i*) Emissive power

(*ii*) Opaque body. [6]

5. (*a*) State the advantages of floating head heat exchanger. [6]

(*b*) Define capacity and economy of evaporator. [4]

(*c*) What is the boiling point elevation of the solution and driving force for heat transfer ? Data : Solution boils at temperature of 380K and boiling point of water at a pressure in the vapor space is 373K temperature of condensing steam is 399K. [3]

Or

6. (*a*) An Evaporator Operating at atmospheric pressure 101.325 Kpa is Fed at the rate of 10,000 kg/h of weak liquor containing 4% Caustic Soda. Thick liquor leaving the Evaporator contains 25% Caustic Soda. find the capacity of evaporator. [5]

(*b*) State why the economy of single effect evaporator is less than one ? [4]

(*c*) Mention the common examples of evaporation operation. [4]

7. (*a*) Draw a neat sketch of double pipe heat exchanger and explain. [4]

(*b*) 20 Kg/sec of water at 360°K entering a heat exchanger is to be cooled to 340°K by using cold water at 300°K flowing at rate of 25Ka/sec and leaving at 316°K. If the overall heat transfer coefficient is 1500 w/m^2K. calculate heat transfer area required in co-current flow concentric pipe heat exchanger ? [4]

(*c*) State the advantages of floating head heat exchanger. [5]

Or

8. (*a*) Give Classification of shell and tube heat exchanger. [6]

(*b*) State advantages of double pipe heat exchanger and its drawbacks. [4]

(*c*) Water at the rate of 1.133 Kg/sec is heated from 35ºC to 75ºC by oil having a specific heat of 1.9Kj/kgºC. The fluids are used in a counter flow double pipe heat exchanger and the oil enters the exchanger at 110ºC and leaves at 75ºC. The Overall heat transfer coefficient is 320 W/m^{2}C. Calculate the heat exchanger area. Specific heat of water is 4.18 Kj/kgºC. [4]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

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S.E. (Chemical) 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.

1. (*a*) A steel rod of 280 mm long and 30 mm diameter is subjected to axial forces alternating between maximum compression of 15 kN and a maximum tension of 5 kN. Find the difference between the greatest and least lengths of rod. E = 210 GPa. [9]

(*b*) What is the difference between the process design and mechanical design ? [4]

Or

2. (*a*) A square pin is required to resist a pull of 40 kN and a shear force of 15 kN. Determine suitable section according to strain energy theory. The material of the pin has elastic limit of 350 MPa and μ = 0.3. Take F.O.S. = 2.5. [7]

P.T.O.

(*b*) Define stress, strain and elasticity. Derive a relation between stress and strain of elastic body. [6]

3. (*a*) How are ends of belts joined ? For horizontal belts, which side (tight or slack) of the belt should run on the top and why ? [5]

(*b*) Design a muff coupling used to connect two shafts transmitting 95 kW at 400 rpm. The material of the shaft and key is plain carbon steel for which allowable shear and crushing stresses are 40 MPa and 80 MPa respectively. The material for the muff is cast iron which has permissible shear stress 15 MPa. Also check safety of the design in shear and crushing. Assume that $T_{max} = 1.25\ T_{avg}$. [7]

Or

4. (*a*) A flat belt is required to transmit 30 kW for a pulley of 1.5 m effective diameter running at 300 rpm. The angle of contact is spread over 11/24 of the circumference. The coefficient of friction between the belt and pulley surface is 0.3. Determine taking centrifugal tension into account, width of the belt required. It is given that the bolt thickness is 9.5 mm. Density of its material is 1100 g/m^3 and the related permissible working stress is 2.5 MPa. [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^2. [5]

5. (*a*) Calculate a suitable diameter for a solid circular shaft to transmit 15 kW at 180 rpm if the allowable shear stress is 80 MPA. [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^2. Ultimate tensile strength of material is 6500 kg/cm^2. 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 the various types of ends used for pressure vessel giving practical applications of each. [6]

(*b*) A pressure vessel is required to process 19 m^3 non-hazardous slurry at 17.7 kg/cm^2, maximum operating temperature are 5ºC and 175ºC. The cylindrical shell of the vessel is closed at both end by 2.1 elliptical head with 5 cm straight flange portion, the maximum ratio of liquid height to vessel diameter is 1.9. The vessel is fabricated from SS 316 having permissible stress 1140 kg/cm^2. The welded joint efficiency is 85%. No corrosion allowance is necessary.

Maximum diameter of the vessel can be 2.4 m.

Calculate :

(*i*) the height of the vessel

(*ii*) minimum thickness of shell and elliptical head. [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^2. Inside crown radius is 6000 mm. Inside knuckle radius is 380 mm. Permissible stress of the material is 1190 kg/cm^2, welded joint efficiency is 100%. [7]

(*b*) Explain with a neat sketch the types of flanged joints used in pressure vessel. [6]

Or

8. (*a*) Write distinguishing points between a thick and thin cylinder. [6]

(*b*) A vertical vessel with a cylindrical shell and hemispherical heads is to be installed in a closed shed. Internal diameter of the vessel is 1800 mm and its thickness is 12 mm. Tangent to tangent length of vessel is 10.5 m. The vessel contains a liquid of density 8000 kg/m^3. The vessel is filled to 75% of its capacity. Determine the total weight of the vessel and the longitudinal stress in the cylindrical shell above and below the support which is at the lower head to shell junction.

Permissible stress of the material = 1040 kg/m^2. Density of material = 7800 kg/m^3. Welded joint efficiency = 85%. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

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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,** 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 a neat diagram. [6]

(*b*) Give the details about the variables in screening operations. [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

(*ii*) Kick's law. [8]

(*b*) Comparison between Crushing and Grinding operations. [4]

P.T.O.

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 a 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]

7. (*a*) Describe in brief electro-flotation plant with a neat diagram. [9]

(*b*) Write short notes on the following : [4]

(*i*) Hydro cyclone

(*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]