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

<table>
<tr><td>Seat No.</td><td></td></tr>
</table>

[5152]-502

S.E. Civil (First Semester) EXAMINATION, 2017
STRENGTH OF MATERIAL
(2015 PATTERN)

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

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

(*ii*) Neat 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. [6]
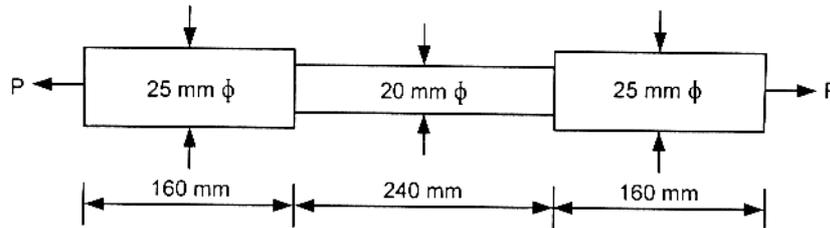
(*b*) A circular pipe of external diameter 70 mm and thickness 8 mm is used as a simply supported beam over an effective span of 2.5 m. Find the maximum concentrated load that can

be applied at the Centre of the span if the permissible stress in the tube is 150 N/mm². [6]
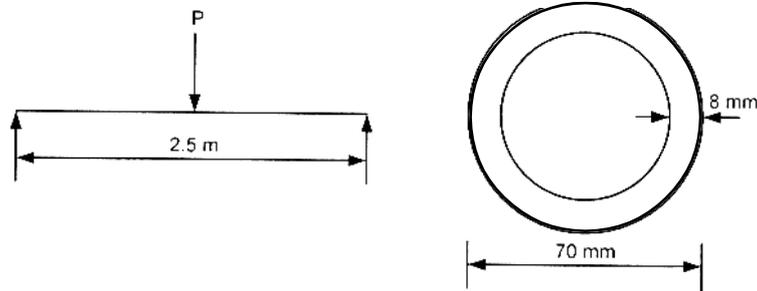
Or

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/m², E_s = 200 GN/m², α_a = 11 × 10⁻⁶/°C and α_s = 12 × 10⁻⁶/°C. [6]
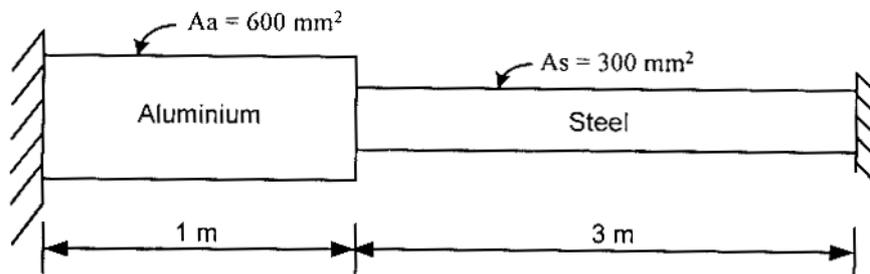
(*b*) A T section 100 mm × 130 mm × 20 mm is subjected to a Shear force of 100 kN. Draw the shear stress distribution and find the maximum shear stress. [6]

3. (*a*) A hollow shaft transmits 100 kW at 120 r.p.m. Allowable shear stress in material is 50 N/mm². Shaft shall not twist 2° in 1 m length. Ratio of Internal diameter to external diameter is 0.25. Take G = 80 kN/mm². 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/mm². The stress at that point is positive magnitude of 35 N/mm². 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 ? State the assumptions made in the determination of shear stress in circular shafts subjected to torsion. [6]

5. (*a*) Draw Shear Force Diagram and Bending Moment Diagram of a simply supported beam as shown in figure. [7]
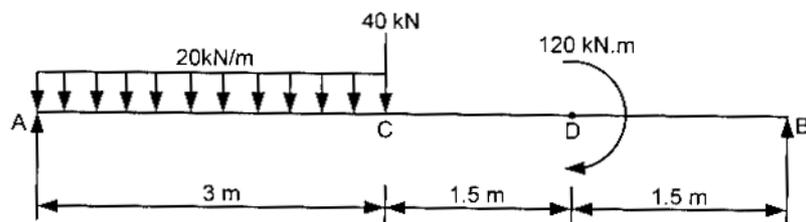
(*b*) Draw the loading diagram and bending moment diagram from the given shear force diagram of a beam. [6]
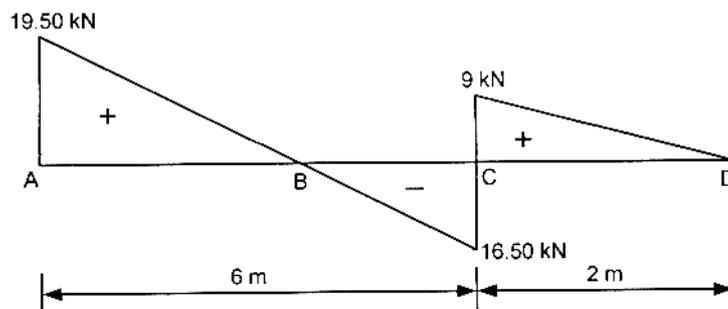
Or

6. (*a*) Draw Shear Force Diagram and Bending Moment Diagram of a simply supported beam as shown in figure. [7]
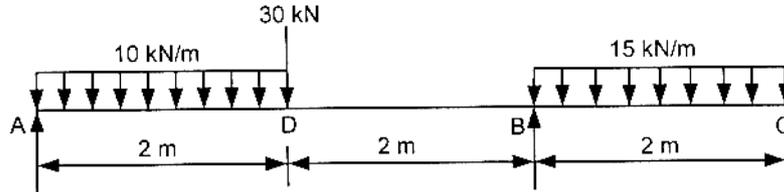
(*b*) Construct loading diagram for the following shear force diagram for a beam as shown in fig. [6]
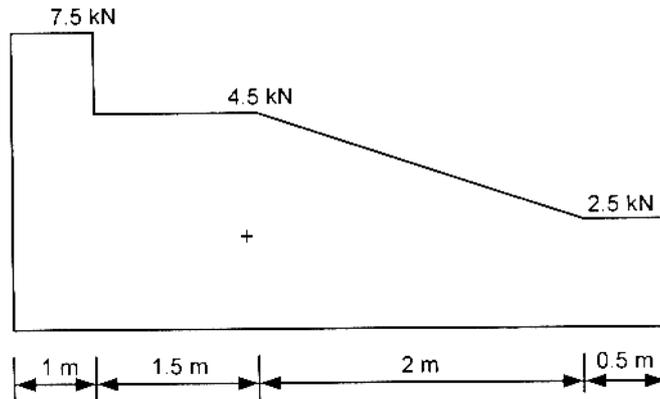
7. (*a*) Calculate the safe compressive load on hollow C.I. Column with one end fixed and other end hinged. The column having a 150 mm external diameter and 100 mm internal diameter and 10 m length. Use Euler's Formula with factor of safety 5. Take E = 95 × 10³ N/mm². [6]

(*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 & Rankine's critical load. Take σ_c = 550 N/mm², $a = \dfrac{1}{600}$ & Take E = 9.4 × 10⁴ N/mm². [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/m² 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/m³. [7]

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

Seat
No.

[5152]-503

S.E. (Civil) (First Semester) EXAMINATION, 2017
GEOTECHNICAL ENGINEERING
(2015 PATTERN)

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

N.B. :— (*i*)   Answer Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**,

Q. No. **5** or Q. No. **6**, Q. No. **7** or Q. No. **8**.

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

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

(*iv*)   Use of calculator is allowed.

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

1.   (*a*)   Explain weathering and distinguish between mechanical and

chemical weathering giving examples.   [6]

(*b*)   Explain in brief *six* factors affecting permeability of soils. [6]

Or

2.   (*a*)   Define and mention the formulae for the following terms :

Void ratio, Porosity, Degree of saturation, Percentage air voids,

Water content, Specific gravity.   [6]

(*b*)   State Darcy's law. Define coefficient of permeability and derive

equation for coefficient of permeability used in constant head

method.   [6]

3. (*a*) In a standard proctor test the following observations were recorded : [7]

Sample No.	Bulk Density (kg/m³)	Water Content (%)
1	1310	16.1
2	1515	19.5
3	1875	27.55
4	1860	33.69
5	1775	34.77

Plot the moisture density curve and find MDD and OMC and also draw ZAV line.

(*b*) Explain direct shear test with respect to the drainage and loading conditions [6]

Or

4. (*a*) Write any *four* assumptions made by Boussinesq to evaluate the stress at a point inside the soil mass due to a point load. Also explain in brief stress Isobar. [7]

(*b*) Define total and effective stress. Determine the shear strength in terms of effective stress on a plane within a saturated soil mass at a point where the total normal stress is 200 kN/m² and the pore water pressure is 80 kN/m². The effective stress shear strength parameters for the soil are c' = 16 kN/m² and phi' = 39°. [6]

5. (*a*) Differentiate between Rankine's and Coulomb's theories of earth pressure. [6]

   (*b*) Explain Active, Passive Earth Pressure with respect to wall movements with sketches. [6]

Or

6. (*a*) Derive the expression for the active state of pressure at any point for a submerged cohesionless backfill along with pressure diagrams. [6]

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

7. (*a*) Write short notes on causes and remedial measures of Landslides. [7]

   (*b*) Derive the expression for factor of safety for dry infinite slope and submerged infinite slope in sandy soils. [6]

Or

8. (*a*) Discuss sources and types of ground contamination. [6]

   (*b*) Explain how soil acts as a geochemical trap and state the various remediation techniques. [7]

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

Seat
No.

[5152]-504

S.E. (Civil) (I Sem.) EXAMINATION, 2017
SURVEYING
(2015 PATTERN)

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

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

(ii) Neat 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 in the examination.

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

1. (a) Enlist and explain the function of each of the instruments required for plane table surveying.   [6]

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

Instrument at	Staff Readings on		Remark
	A	B	
A	0.656	2.097	Distance between
B	0.867	2.298	A & B is 950 m

(i) Find the true R.L. of B, if R.L. of A = 378.655 m.

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

(*iii*)   Find the collimation error.

Or

2.   (*a*)   Correct the bearing of a closed traverse PQRSP for a local attraction if any.   [6]

Line	PQ	QR	RS	SP
F.B.	S45°30'E	S60°00'E	S5°30'E	N83°30'W
B.B.	N45°30'W	N60°40'W	N3°20'W	S85°00'E

(*b*)   Explain the need and procedure of the terms profile levelling and cross-sectioning with sketches in a road project.   [6]

3.   (*a*)   Define the following terms :
Transiting, Telescope normal, Latitude, Face right.   [4]

(*b*)   A tacheometer was set up at a station A and the following reading were obtained on a vertically held staff. The constants of the instrument were 100 and 0.1.   [8]

Station	Staff station	Vertical angle	Hair reading (in mtrs)	Remarks
P	B.M.	–4°22'	1.050, 1.103, 1.156	R.L. of B.M.
P	Q	+10°0'	0.952, 1.055, 1.158	is = 1958.300 mtrs.

Find the horizontal distance from P to Q and the reduced level of station Q.

Or

4. (*a*)   Determine the missing data for the following table of a closed
traverse ABCDA. [8]

Line	AB	BC	CD	DA
Length (m)	230.5	250.2	210.8	—
Bearing	N36°45'E	S82°48'E	S10°15'E	—

(*b*)   Explain the laboratory method to determine the tacheometric
constant. [4]

5. (*a*)   Two roads AB & BC meets at an angle of intersection
127° 30' at a chainage of 1280 m. Calculate the necessary data
for setting out a curve with radius of 150 m by offset from
long chord method. [7]

(*b*)   Enlist various linear methods of setting out curves and explain
any *one* with sketch. [6]

Or

6. (*a*)   What is meant by "transition curve" ? What are the different
forms of a transition curve ? Give reasons to introduce the
transition curve. [6]

(*b*)   Two tangents AB & BC meets at B with deflection angle 40°
at a chainage of 1280 m. Calculate the necessary data for
setting out a curve with radius of 150 m by   One theodolite
(with 20" L.C.) method take peg interval of 20 m. [7]

7. (*a*) Write a short note on segments of Space Based Positioning System. [6]

(*b*) Write a note on setting out a building. [7]

Or

8. (*a*) Enlist the limitations of the prevalent survey techniques and so give advantages of Space Based Positioning System. [7]

(*b*) Enlist and explain various stages in road survey project. [6]

Total No. of Questions—8]

Seat
No.

[5152]-505

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

ENGINEERING MATHEMATICS—III

(2015 PATTERN)

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

N.B. :— (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or*

Q. No. **4**, Q. No. **5** *or* Q. No. **6** and Q. No. **7** *or*

Q. No. **8**.

(*ii*) Draw neat diagram wherever needed.

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

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

(*v*) Use of non-programmable pocket calculator is allowed.

1. (*a*) Solve any *two* of the following :   [8]

   (*i*) $\dfrac{d^3y}{dx^3} - 4\dfrac{dy}{dx} = 2 \cosh 2x$

   (*ii*) $(D^2 + 4)\, y = \sec 2x$

   (by method of variation of parameters)

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

P.T.O.

(b) Solve the following equations by using Gauss-elimination method : [4]

$$3x_1 + 4x_2 + x_3 = 3$$

$$3x_1 + 2x_2 - 2x_3 = -2$$

$$x_1 - x_2 + x_3 = 6.$$

Or

2. (a) Find the equation of elastic curve of a uniform cantilever beam of length l having a constant weight w kg per foot and determine the deflection of the free end. [4]

(b) Use Euler's modified method to find the value of y satisfying the equation :

$$\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}; \ y(1) = 1$$

for $x = 1.1$ correct to three decimal places by taking $h = 0.1$. [4]

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

$$3x + 2y + 7z = 4$$

$$2x + 3y + z = 5$$

$$3x + 4y + z = 7.$$

3. (*a*) Find the correlation co-efficient for the following table : [4]

x	y
10	18
14	12
18	24
22	6
26	30
30	36

(*b*) In a certain factory turning out razor blades, there is a small chance of 0.002 for any blade to be defective. The blades are supplied in packets of 10. Use Poisson's distribution to calculate appoximate number of packets containing no defective and one defective respectively in a consignment of 10000 packets. [4]

(*c*) Find the directional derivative of [4]

$$\phi = xy^2 + yz^3$$

at $(2, -1, 1)$, along the line $2(x - 2) = (y + 1) = (z - 1)$.

Or

4. (*a*) The first four moments about a working mean 5, are 7, 70, 140 and 175. Calculate the central moments and hence β_1 and β_2. [4]

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

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

(ii) $\nabla \cdot \left[r \, \nabla \left(\dfrac{1}{r^n} \right) \right] = \dfrac{n(n-2)}{r^{n+1}}$.

(c) Show that

$$\bar{F} = (2xz^3 + 6y)\hat{i} + (6x - 2yz)\hat{j} + (3x^2y^2 - y^2)\hat{k}$$

is irrotational. Find scalar potential ϕ such that $\bar{F} = \nabla \phi$. [4]

5. Attempt any *two* :

(a) Evaluate [6]

$$\int_C \bar{F} \cdot d\bar{r} \,,$$

where

$$\bar{F} = 3x^2\bar{i} + (2xz - y)\bar{j} + z\bar{k}$$

along the curve

$$x = t, \ y = t^2, \ z = t^3$$

from (0, 0, 0) to (1, 1, 1).

(b) For a closed surface S enclosing the volume V if [6]

$$\iint_S \frac{1}{r^2}\bar{r} \cdot d\bar{S} = \iiint_V \frac{1}{r^2}dV \,,$$

then evaluate

$$\iint_S \frac{x\bar{i} + y\bar{j} + z\bar{k}}{r^2} \cdot d\bar{S}$$

where S is the sphere

$$x^2 + y^2 + z^2 = a^2 \ \text{and} \ \bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$$

(c)   Evaluate   [7]

$$\iint_S \left(\nabla \times \overline{F} \right) . \hat{n} \, ds,$$

where

$$\overline{F} = \left(x - y \right) \overline{i} + 2xz\overline{j} + xy\overline{k}$$

and S is the curved surface of the paraboloid

$$x^2 + y^2 = 2z$$

bounded by the plane $z = 3$.

Or

6.   Attempt any *two* :

(a)   Find the work done by the force   [6]

$$\left(x^2 - yz \right)\overline{i} + \left(y^2 - zx \right)\overline{j} + \left(z^2 - xy \right)\overline{k}$$

in taking a particle from (1, 1, 1) to (2, 2, 2) in straight

line.

(b)   Using Stokes' theorem evaluate   [6]

$$\iint_S \nabla \times \overline{F}.d\overline{S}$$

for

$$\overline{F} = -y^3\overline{i} + x^3\overline{j},$$

where the boundary of the surface S is given by :

$$C : \frac{x^2}{1} + \frac{y^2}{4} = 1.$$

(c)   Evaluate   [7]

$$\iint\limits_{S} \overline{F} \cdot d\overline{S},$$

where S is the curve surface of the sphere

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

above the plane $z = 0$ and

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

7.   Solve any *two* of the following :

(a)   A string is stretched and fastened to two points l apart. Motion

is started by displacing the string in the form

$$u = a \sin\frac{\pi x}{l}$$

from which it is released at time $t = 0$. Find the displacement

$u(x, t)$ from one end.   [7]

(b)   Solve the one dimensional heat flow equation :   [6]

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

subject to the following conditions :

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

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

(iii) $u(x, 0) = \dfrac{u_0 x}{l}$, $0 < x < l$, u_0 is constant

(iv) $u(n, t)$ is bounded.

(c) A thin sheet of metal is bounded by the x-axis and the lines $x = 0$ and $x = 1$ and stretching to infinity in y direction and its vertical edges and edge at infinity are maintained at the constant temperature 0°C, while temperature on short edge $y = 0$ is given by [6]

$$u(x, \ 0) \ = \ x, \qquad 0 \ < \ x \ \leq \ 0.5$$
$$= \ 1 \ - \ x, \ 0.5 \ \leq \ x \ \leq \ 1.$$

Find the steady state temperature $u(x, y)$.

Or

8. Solve any *two* of the following :

(a) It a string of length l is initially at rest in its equilibrium position and each of its point is given a velocity $v(x)$ such that :

$$v(x) \ = \ cx, \qquad 0 \ < \ x \ < \ \frac{l}{2},$$
$$= \ c(l \ - \ x), \ \frac{l}{2} \ \leq \ x \ < \ l.$$

Obtain the displacement $y(x, \ t)$ at any time t. [7]

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

$$u(x, \ 0) \ = \ x, \qquad 0 \ \leq \ x \ \leq \ 50$$
$$= \ 100 \ - \ x, \ 50 \ \leq \ x \ \leq \ 100.$$

Find the temperature at any time t. [6]

(*c*) An infinitely long metal plate is enclosed between lines $y = 0$ and $y = l$ for $x > 0$. The temperature is zero along the edges $y = 0$ and $y = l$ and at infinity. If the edge $x = 0$ is kept a constant temperature u_0, find the steady state temperature distribution $u(x, y)$.   [6]

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

Seat
No.

[5152]-507

S.E. (Civil) (II Sem.) EXAMINATION, 2017
ARCHITECTURAL PLANNING AND DESIGN OF BUILDINGS
(2015 PATTERN)

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

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

　　　　(*ii*)　Solve Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**
　　　　　　on the drawing sheet only.

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

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

1.　(*a*)　Write a short note on TDR. Who is eligible for TDR and enlist
　　　　　the documents required for TDR ?　　　　　　　[7]

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

　　　　(*i*)　Green roofing

　　　　(*ii*)　Cost effective housing.

Or

2.　(*a*)　Write a short note on NOC from roads, National and State
　　　　　Highways. Which dicuments are required for application ? [7]

　　(*b*)　Explain the following principle of architectural planning with
　　　　　sketches :　　　　　　　　　　　　　　[6]

　　　　(*i*)　Unity

　　　　(*ii*)　Composition.

　　　　　　　　　　　　　　　　　　　　　　　　P.T.O.

3. (*a*) What do you mean by perspective drawing ? What are the objectives of perspective drawing ? [7]

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

(*i*) Reverberation and Sabine's expression

(*ii*) Formation of echoes.

Or

4. (*a*) Write short notes on : [7]

(*i*) Winter air conditioning system

(*ii*) Summer air conditioning system.

(*b*) Write a short note on One pipe system and Two pipe system of plumbing. [6]

5. Draw a detailed plan to a scale of 1 : 50 or suitable for line plan shown in fig. [13]
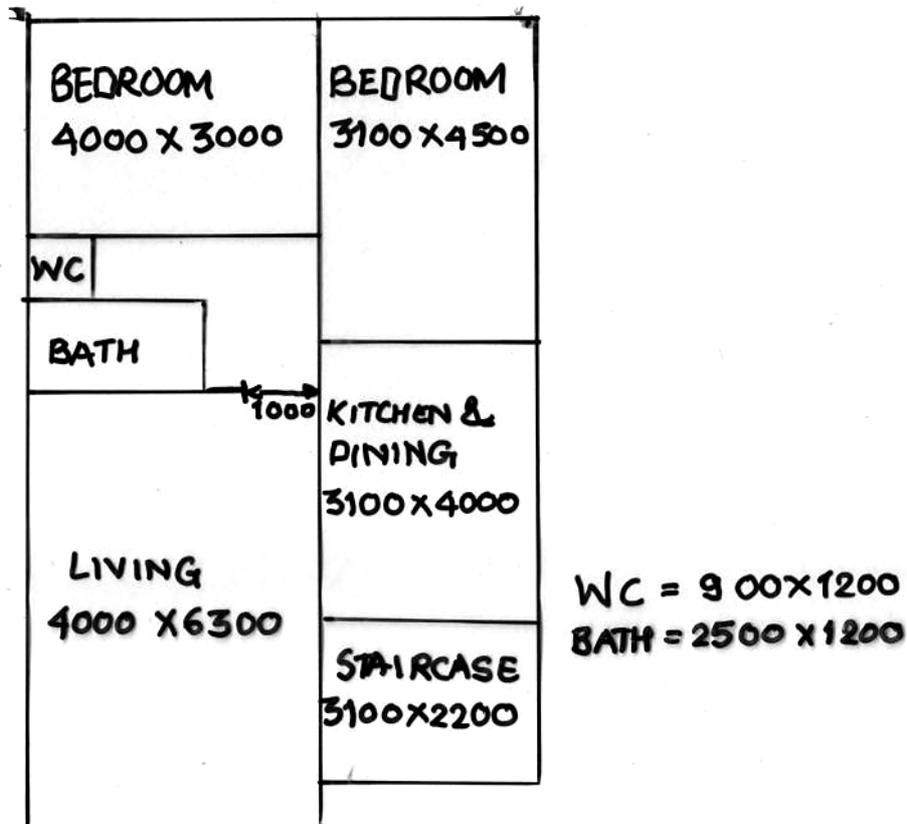
Refer the following guidelines

(*i*) The structure is RCC framed structure.

(*ii*) Wall thickness : External – 230 mm, Internal – 100 mm

(*iii*) Assume suitable size of doors and windows

(*iv*) Access to the terrace is provided through staircase

(*v*) Floor to floor height – 3240 mm

(*vi*) Plinth height – 600 mm

(*vii*) All the dimensions are in mm

(*viii*) Tread – 250 mm

Riser – 180 mm

Or

6. Draw to a scale 1 : 50 or suitable, detailed plan of a bungalow for the following conditions : [13]

(*i*) Living room 1 no – 18 m^2 approx.

(*ii*) Kitchen cum dining – 12 m^2 approx.

(*iii*) Master bedroom (inclusive of toilet) – 18 m^2 approx.

(*iv*) Guest room – 12 m^2

(*v*) Study room – 12 m^2

(*vi*) 1 separate WC and bath

(*vii*) Passage – 1.2 m wide

(*viii*) Floor to floor height – 3.0 m

(*ix*) RCC framed structure

(*x*) Plinth height – 600 mm

(*xi*) Provide suitable staircase

7. Design a primary school for 5 classrooms, the building is single storied and is RCC framed structure. The following units are be provided : [12]

(i) Number of students per classroom – 40

(ii) Primary classroom – 50 m^2

(iii) Drawing room – 75 m^2

(iv) Headmasters room – 15 m^2

(v) Administrative office – 30 m^2

(vi) Common staff room – 60 m^2

(vii) Medical unit – 30 m^2

(viii) Book store – 15 m^2

(ix) Sanitary block (Ladies and gents) : suitable no.

Draw to a scale of 1 : 50 or suitable, line plan with North line.

Or

8. Design a Rest House for 6 rooms, the building is single storied and RCC framed structure. The following units are to be provided : [12]

(i) Bedroom with attached toilet :

    (a) Bedroom – 12 m^2

    (b) Toilet – 3 m^2

(ii) Circulation space verandah – 2 m wide

(iii) Dining hall – 20 m^2

(iv) Kitchen – 12 m^2

(v) Store – 6 m^2

(vi) Office – 12 m^2

(vii) Sanitary block (Ladies and gents) – Suitable no.

Draw to a suitable scale line plan with North direction.

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

Seat
No.

[5152]-510

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

EXAMINATION, 2017

ENGINEERING GEOLOGY

(2015 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*) How are sedimentary rocks formed ? Explain types of sedimentary deposits with examples. [6]

(*b*) Write note on INTERIOR of THE EARTH. [6]

Or

2. (*a*) What is Metamorphism ? Describe GNEISSOSE and SCHISTOSE texture with neat sketches. [6]

(*b*) What are CLASTIC and NONCLASTIC secondary rocks ? Describe CLASTIC texture with neat diagram. [6]

3. (*a*) Describe any *three* features developed by RIVER deposition. [6]

(*b*) Why are observations and precautions necessary in the core drilling process ? [6]

P.T.O.

Or

4. (*a*) Write note on ARCHEANS and DHARWARS. [6]

(*b*) How can nature of the rocks be assessed on number of pieces present in one RUN ? [6]

5. (*a*) Describe any *two* geological conditions leading to natural springs ? [7]

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

   (*i*) Anticline

   (*ii*) Syncline.

Or

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

(*b*) What is seismology ? Explain various seismic waves. Describe CIRCUMPACIFIC RING OF FIRE. [6]

7. (*a*) What are Natural and Artificial causes of Landslides ? Enlist measures to prevent landslide. [7]

(*b*) What Geological studies are required to be carried out in reservoir area of proposed dam site ? [6]

Or

8. (*a*) What are CORE RECOVERY and RQD ? On the basis of the further logging 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
	1	09	M	Basaltic rocks
	2	10	J	
	3	09	M	
	4	40	J	
	5	20	J	
	6	34	J	
	7	55	J	
	8	42	J	
	9	50	J	
	10	31	J	

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

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

Seat
No.

[5152]-511

S.E. (Mechanical/Sandwich/Auto.) (I Sem.) EXAMINATION, 2017

ENGINEERING MATHEMATICS—III

(2015 PATTERN)

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

1.   (*a*)   Solve any *two* of the following :   [8]

(*i*) $(D^2 + 13D + 36)y = e^{-4x} + \sinh x$

(*ii*) $(D^2 - 2D + 2)y = e^x + \tan x$

(using method of variation of parameter)

(*iii*) $x^2 \dfrac{d^2y}{dx^2} - 4x \dfrac{dy}{dx} + 6y = x^5.$

(*b*)   Using Fourier integral representation show that :   [4]

$$\int_0^\infty \frac{\lambda^3 \sin \lambda x}{\lambda^4 + 4} d\lambda = \frac{\pi}{2} e^{-x} \cos x, \ x > 0.$$

P.T.O.

Or

2. (*a*) A body of weight 9.8 N is suspended from a spring having constant 4 N/m. Prove that the motion is one of the resonance if a force 16 sin 2*t* is applied and damping force is negligible. Assume that initially the weight is at rest in the equilibrium position. [4]

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

(*i*) Find the Laplace transform of :

$$\cosh t \int_0^t e^t \cosh(t)\, dt .$$

(*ii*) Find the Inverse Laplace Transform of $\cot^{-1}\left(\dfrac{s-2}{3}\right)$.

(*c*) Using Laplace transform solve the D.E. : [4]

$$y'' + 2y' + y = te^{-t}, \ y(0) = 1, \ y'(0) = -2.$$

3. (*a*) If [4]

$$\Sigma f = 27, \ \Sigma fx = 91, \ \Sigma fx^2 = 359,$$

$$\Sigma fx^3 = 1567, \ \Sigma fx^4 = 7343.$$

Find the first four moments about origin. Also find $\mu_2, \ \mu_3, \ \mu_4$.

(b)   An unbiased coin is thrown 10 times. Find the probability of getting exactly 6 heads and at least 6 heads using binomial distribution.   [4]

(c)   Find the directional derivative of $xy^2 + yz^3$ at (2, −1, 1) along the line $2(x - 2) = y + 1 = z - 1$.   [4]

Or

4.   (a)   Obtain regression lines for the following data :   [4]

x	*y*
6	9
2	11
10	5
4	8
8	7

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

(i) $\nabla^2 f(r) = f''(r) + \dfrac{2}{r} f'(r)$

(ii) $\nabla \cdot \left[r \nabla \left(\dfrac{1}{r^3} \right) \right] = \dfrac{3}{r^4}$.

(c) Show that the vector field [4]

$$\overline{F} = (x + 2y + 4z)\overline{i} + (2x - 3y - z)\overline{j} + (4x - y + 2z)\overline{k}$$

is irrotational and hence find scalar function ϕ such that $\overline{F} = \nabla\phi$.

5. (a) Evaluate :

$$\int_C \overline{F} \cdot d\overline{r}$$

where

$$\overline{F} = x^2\overline{i} + xy\overline{j}$$

and C is the straight line $y = x$, joining (0, 0) and (1, 1).

(b) Prove that : [4]

$$\iint_S (\phi\nabla\psi - \psi\nabla\phi) \cdot d\overline{S} \iiint_V (\phi\nabla^2\psi - \psi\nabla^2\phi)dV .$$

(c) Use Stokes' theorem to evaluate : [5]

$$\int_C (4y\overline{i} + 2z\overline{j} + 6y\overline{k}) \cdot d\overline{r}$$

where C is the curve of intersection of $x^2 + y^2 + z^2 = 2z$ and $x = z - 1$.

Or

6. (a) Evaluate : [4]

$$\int_C \overline{F} \cdot d\overline{r}$$

where

$$\overline{F} = xy^2\overline{i} + y\overline{j}$$

and C is curve $x = t$, $y = t^2$, joining $t = 0$ and $t = 1$.

(*b*) Evaluate : [5]

$$\iint_S \overline{F} \cdot d\overline{s}$$

where

$$\overline{F} = yz\overline{i} + zx\overline{j} + xy\overline{k}$$

and S is the upper part of the sphere

$$x^2 + y^2 + z^2 = 1$$

above *xoy* plane.

(*c*) Evaluate : [4]

$$\iint_S \left(\nabla \times \overline{F} \right) \cdot \hat{n}\, ds$$

where

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

and S is the surface of a rectangular lamina bounded by :

$$x = 0,\ y = 0,\ x = 1,\ y = 2,\ z = 0.$$

7. (*a*) Solve the wave equation [7]

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

with boundary conditions :

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

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

(*iii*) $\left(\dfrac{\partial u}{\partial t}\right)_{t=0} = 0,$

(*iv*) $u(x, 0) = a \sin\dfrac{\pi x}{l}$

(*b*)   Solve the heat equation   [6]

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

for the function $u(x, t)$, subject to the following conditions :

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

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

(*iii*) $u(x, 0) = x, \ 0 \le x < l$

(*iv*) $u(x, \infty)$ is finite.

<div align="center">

Or

</div>

8.   (*a*)   Solve the Laplace equation   [6]

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

subject to condition :

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

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

(*iii*) $u(\infty, y) = 0,$

(*iv*) $u(0, y) = a_0.$

(*b*) Use Fourier transform to solve : [7]

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, \quad 0 < x < \infty, \ t > 0$$

where $u(x, t)$ satisties the conditions :

(*i*) $\left(\dfrac{\partial u}{\partial x}\right)_{x=0} = 0, \ t > 0$

(*ii*) $u(x, \ 0) = \begin{cases} x & 0 < x < 1 \\ 0 & x > \end{cases}$

(*iii*) $|u(x, \ t)| < m.$

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

Seat
No.

[5152]-512

B.E. (Mechanical/Automobile Engineering) (Semester I)

EXAMINATION, 2017

MANUFACTURING PROCESS—I

(2008 PATTERN)

Time : Two Hours   Maximum Marks : 50

N.B. :— (i) *All* questions are compulsory i.e. Solve Q. No. **1** *or*

Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**,

Q. No. **7** *or* Q. No. **8**.

(ii) Figures to the right indicate full marks.

(iii) Assume suitable data, if necessary.

(iv) Neat diagrams must be drawn wherever necessary.

1. (*a*) What do you know by pattern allowance ? Describe the different

types of pattern allowances. Also, state in general the magnitude

for these allowances. [6]

(*b*) A cylindrical riser having unit diameter to height ratio

[d/h) = 1] is to be designed for a sand casting mould. The

size of steel casting is 40 mm × 80 mm × 30 mm. The previous

observations indicated the total solidification time for casting

is 90 seconds. However, find the size of the riser to obtain

total solidification time of 120 seconds. [6]

P.T.O.

Or

2. (*a*) Differentiate the terms bloom, billet and slab that are commonly used in the context of metal forming. Also state the types of rolling mills. [6]

(*b*) A solid cylindrical piece made of high carbon steel is having diameter of 60 mm and height of 96 mm. Using open die forging, this solid cylindrical piece is reduced in height by 40% at room temperature. Assume the coefficient of friction as 0.12 and the work metal strength coefficient 'K' as 450 MPa and strain hardening exponent '*n*' as 0.15. Calculate the forging force at the end of stroke. [6]

3. (*a*) With a schematic explain the working of blow moulding process. [6]

(*b*) Explain with sketches the manufacturing of plastic pipes and sheets. [6]

Or

4. (*a*) State the merits and limitations of leftward and rightward welding techniques with neat sketches. [6]

(*b*) State the types of adhesives along with their desirable properties. Also, describe the stages of adhesive bonding. [6]

5. (*a*) Name the different types of presses according to power system (energy used) and drive system (drive mechanisms) used for sheet metal working operations. Also, draw neat sketches of any two drive mechanisms that are used for sheet metal presses. [6]

(*b*) Design a strip layout for manufacturing a component as shown in figure. The thickness of the component is 1.2 mm. Take ultimate shear stress value as 210 N/mm^2. Also find the percentage utilization, centre of pressure and press capacity. [7]
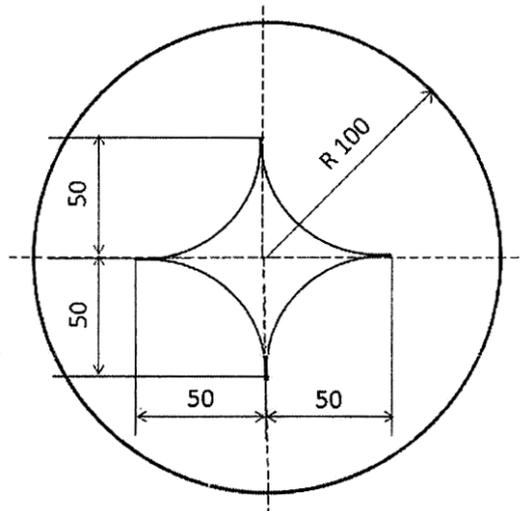
Or

6. (*a*) Explain with sketches methods of reducing cutting forces in sheet metal working. [6]

(*b*) A cup of internal diameter 50 mm, height 70 mm is to be drawn from a 1.2 mm cold rolled steel with ultimate tensile

strength of 390 MPa. The corner radius for cylindrical cup is 1 mm. Percentage reduction permitted in the first draw is 50% and in the second, third and fourth draw is 30%, 20% and 15% respectively. Consider trimming allowance of 3.2 mm for each 25 mm of cup diameter. Find size of the blank, number of draws required, punch and die dimensions and drawing pressure for each draw. Consider value of die constant 'c' as 0.7 and value of punch and die clearance as 1.15 times thickness of sheet. [7]

7. (*a*) State the different types of chuck that are used to hold the workpiece while machining on lathe. Describe the working of any *one* type of chuck with a neat sketch. [6]

(*b*) Calculate the change gears for cutting two start left hand threads of 1.4 mm pitch on a lathe having 5 mm pitch lead screw. Available gears are 20 to 120 teeth in steps of 5. Also suggest two more alternative solutions for change gears other than obtained in the earlier step. Sketch the gear train and suggest what modification is required for cutting right hand threads ? [7]

Or

8. (*a*) Explain with a neat sketch taper turning operation to be carried out using a tailstock setover method. [6]

(*b*) A workpiece of 60 mm diameter and 180 mm length is to be turned down to 54 mm for length. The maximum allowable depth of cut is 0.6 mm. Assume feed as 0.2 mm/rev and cutting speed as 2.5 metre per second. If the approach length is 40 mm and over travel is 30 mm, then calculate the machining time. If feed changes to 0.2 mm/second keeping the cutting speed same as given above, will the machining time remain same or changes and if changes, find its value and percentage change in machining time due to change in feed from 0.2 mm/rev to 0.2 mm/second. [7]

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

Seat
No.

[5152]-514

S.E. (Mechanical/Automobile Engg.) (First Semester)

EXAMINATION, 2017

MATERIAL SCIENCE

(2015 PATTERN)

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

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

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

(*iii*)　Use of Calculator is allowed.

(*iv*)　Assume Suitable data if necessary.

(*v*)　Answer Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q. No. **5** or Q. No. **6**, Q. No. **7** or Q. No. **8**.

1. (A)　Calculate atomic packing factor for BCC and FCC crystal structure. [6]

(B)　What is strain hardening and how does it affect plastic deformation ? Explain theory of dislocation on the basis of rotation of slip planes during plastic deformation. [6]

Or

2. (A)　What do you mean by the term "Miller Indices" ? Explain the procedure and determine the Millar indices for plane (111). [4]

P.T.O.

(B) What makes ceramics different than polymers with respect to properties ? [2]

(C) What are different classifications of imperfections in crystal structure ? Explain the point imperfection in detail. [6]

3. (A) What is the basic difference between destructive and non-destructive testing ? Explain the purpose of the following testing methods :

(1) Tensile test

(2) Ultrasonic

(3) Creep test. [7]

(B) What do you mean by the term corrosion ? What are the different ways to delay the destruction of metal under corrosion ?

[6]

Or

4. (A) Identify the type of corrosion for the following cases : [4]

(*i*) Formation of cavities of small anodic area around which metal is relatively unattacked as compared large cathodic area.

(*ii*) Simultaneous effect of environment and cyclic fluctuation of stress.

(*iii*) The grain boundary phase or a region adjacent to the grain boundary becomes anodic and get preferably corroded due to precipitation of some phase.

(iv) An accelerated attack at the junction of two metals exposed to a corrosive environment.

(B) What is sacrificial anode ? [3]

(C) What is the basic difference between hardness and toughness of the material ? Explain the method to determine the toughness. [6]

5. (A) What are the properties of coating materials ? Which are affects surface quality ? Explain any *three* surface cleaning methods. [6]

(B) What is shot blasting ? [3]

(C) List out the factors affecting electro-deposition [3]

Or

6. (A) Compare PVD and CVD coating. [4]

(B) Explain the process of Ion vapour deposition (IVD) with principle of working, advantages and disadvantages and applications. [6]

(C) What is powder coating ? [2]

7. (A) Explain the basic steps of powder metallurgy process. [4]

(B) Explain the role and function of lubricants and binders in Powder Metallurgy. [6]

(C) Why is sintering important step in Powder Metallurgy ? [3]

Or

8. (A) Sieve analysis method is used in determination which property of powder metallurgy ? Explain it with neat diagram. [5]

(B) Write flow chart of production of friction material. [4]

(C) Explain Carbonil process for powder manufacturing. [4]

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

Seat
No.

[5152]-515

S.E. (Mechanical/Automobile/Sandwich) (First Semester)
EXAMINATION, 2017
STRENGTH OF MATERIALS
(2015 PATTERN)

Time : Two Hours   Maximum Marks : 50

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

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

(iii) Use of calculator is allowed.

(iv) Assume suitable data if necessary.

1.   (a)   Determine the stress in each section of the circular bar as
           shown in figure when subjected to an axial tensile load of
           20 kN.   [4]

Not to scale
all dimensions are in mm
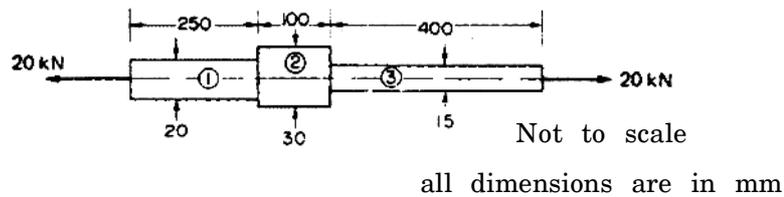
(b)   Draw SF and BM diagrams for the given beam.   [8]
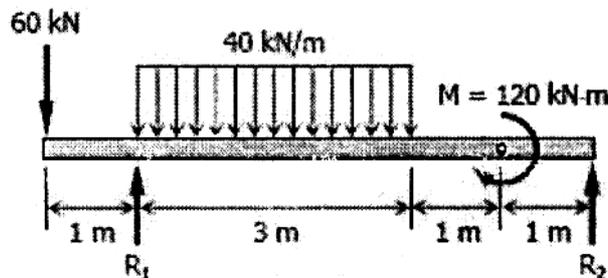
2. (*a*) The composite bar as shown in figure is rigidly fixed at the ends A and B. Determine the reaction developed at ends when the temperature is raised by 18°C. Given E_{Al} = 70 kN/mm², E_s = 200 kN/mm², α_{Al} = 11 × 10⁻⁶/°C, α_{st} = 12×10⁻⁶/°C [6]
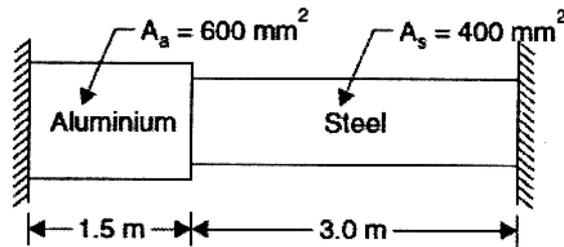
(*b*) Derive SF and BM equations and then draw SFD and BMD of a given beam. [6]
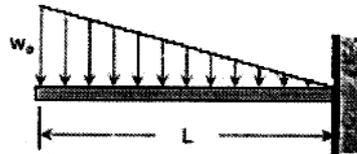
3. (*a*) A symmetrical H section with height 120 mm, width 120 mm and thickness 20 mm is used as a simply supported beam and carries UDL of 60 kN/m over a span of 3 m. Determine shear stress at the neutral axis of H section if moment of inertia about neutral axis is 5.75 × 10⁶ mm⁴. [6]

(*b*) Determine slope at the simple supports R_1 and R_2 of given overhang beam in terms of EI. [6]
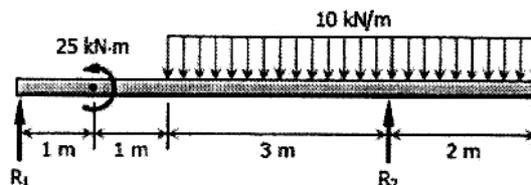
Or

4. (*a*) Simply supported beam with point load W at the center and length 2 m. The cross-section of beam is T section (flange 100 mm × 12 mm and web 38 mm × 12 mm). The allowable bending stress in tension and compression are 100 MPa and 150 MPa. Find safe load W. [6]

(*b*) A cantilever beam of length 4 m and UDL of 60 N/m. Determine strain energy stored in the beam. Assume I = 1 × 10⁻⁶ m⁴ and E = 200 GPa. [6]

5. (*a*) A solid circular bar 25 m long and 120 mm was found to be extended 1.2 mm under tensile load of 52 kN. Now the same bar is used as a strut. Determine critical load and safe load taking FOS = 3 with the following end conditions :

(*i*) Both ends fixed, and

(*ii*) One end fixed and other end hinged. [6]

(*b*) A compound shaft consisting of a steel segment and an aluminum segment is acted upon by two torques as shown in Fig. Determine the maximum permissible value of T subject to the following conditions: τ_{st} = 83 MPa, τ_{Al} = 55 MPa, and the angle of rotation of the free end is limited to 6°. For steel, G = 83 GPa and for aluminum, G = 28 GPa. [7]
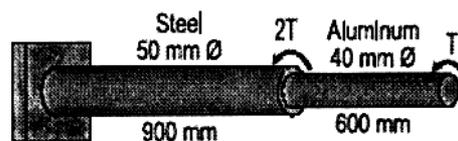
Or

6. (*a*) The compound shaft shown in Fig. is attached to rigid supports. For the bronze segment AB, the diameter is 75 mm, $\tau \leq 60$ MPa, and G = 35 GPa. For the steel segment BC, the diameter is 50 mm, $\tau \leq 80$ MPa, and G = 83 GPa. If a = 2 m and b = 1.5 m, compute the maximum torque T that can be applied. [7]
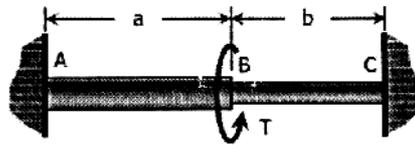
(*b*) The rod PQ of length L and flexural rigidity EI is hinged at both ends. For what minimum force F is it expected to buckle ? [6]
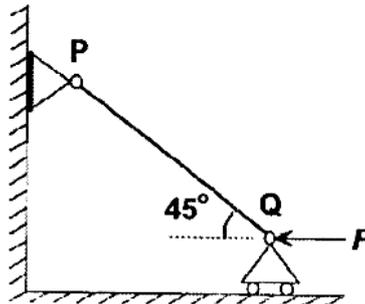
7. (*a*) State of stress for an element of unit thickness is shown in Figure. Find the normal stress and shear stress that must act on an inclined dotted plane to keep the element in equilibrium and show the result on inclined plane with proper orientation. [7]
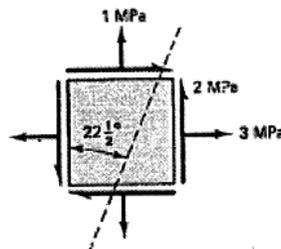
(b) At a certain position of circular structure of diameter *d* is subjected to shear force of 10 kN together with an axial tensile load of 20 kN. If the allowable working stress is 67.5 MPa. Estimate the magnitude of '*d*' required according to the maximum principal stress theory. [6]

Or

8. For the given state of plane stress [13]
   (*a*) Construct Mohr's circle with proper scale on graph paper.
   (*b*) Determine principal stresses and its orientation from Mohr's ircle.
   (*c*) Determine shear stress and normal stress on maximum shear plane and its orientation from Mohr's circle.
   (*d*) Represent all the stresses and plane orientations in Mohr's circle.
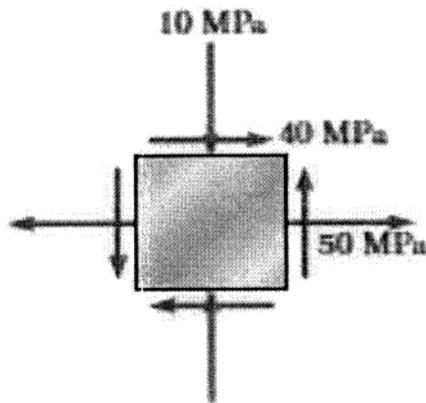
Total No. of Questions—8]   [Total No. of Printed Pages—3

Seat
No.

[5152]-519

S.E. (Mech./Automo.) (Second Semester) EXAMINATION, 2017

APPLIED THERMODYNAMICS

(2015 PATTERN)

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

N.B. :— (*i*) Answer **4** questions out of **8**.

(*ii*) 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**.

(*iii*) *All* the four questions should be solved in one answer book and attach extra supplements if required.

(*iv*) Draw diagrams wherever necessary.

(*v*) Use of scientific calculator is allowed.

(*vi*) Assume suitable data wherever necessary.

1. (*a*) What is heat engine ? Differentiate between internal and external combustion engine.   [6]

(*b*) Explain the detonation in SI engine with p-θ diagram.   [6]

Or

2. (*a*) Explain actual engine cycle with at least three losses.   [6]

(*b*) Explain Combustion chambers used in SI engine.   [6]

3. (*a*) Compare knocking in SI and CI engines. Explain the effect of supercharging and compression ratio on knocking in SI and CI engine with suitable reasons. [6]

(*b*) The following observations were recorded during a test on 4 stroke single cylinder diesel engine. [6]

Bore = 200 mm, stroke = 250 mm, mean effective pressure = 0.6 MPa.

Brake drum diameter = 1.2 m, net brake load = 50 kg, Mean piston speed = 300 m/min. Find :

(*i*) Friction power

(*ii*) Mechanical efficiency.

Or

4. (*a*) What is ignition delay in CI engines ? Explain four factors affecting the ignition delay. [6]

(*b*) In a test of an oil engine under full load condition, the following results were obtained. [6]

Frictional Power = 10 kW, rpm = 1750; fuel used = 15 kg/hr, brake torque = 327.5 Nm, Calorific value of fuel used = 42000 kJ/kg, air supplied = 4.75 kg/min, volume flow rate of cooling water = 14 lit/min, room temperature = 21ºC, rise in temperature of cooling water = 45ºC, exhaust gas temperature = 400ºC.

Cp_w = 4.2 kJ/kg K, Cp_g = 1.23 kJ/kg K,

Find ISFC. Also draw heat balance sheet on kW basis.

5. (*a*) Explain with the help of neat diagram exhaust gas recirculation system. [6]

(*b*) What are the functions of lubrication system ? Explain pressurized lubrication system with neat sketch. [7]

Or

6. (*a*) Discuss the effect of A : F ratio on emission : [6]
1. NO_x, 2. UBHC, 3. CO

(*b*) Explain battery ignition system with neat schematic sketch. [7]

7. (*a*) How to increase the isothermal efficiency of reciprocating air compression ? [6]

(*b*) A two stage reciprocating air compressor takes in air at 1 bar and 300 K. Air is delivered at 15 bar. The intermediate pressure is ideal and intercooling is perfect. The law for compression is $PV^{1.25}$ = C. The rate of dischage is 10 kg/min. [7]
Find :
(*i*) Power required to drive the compressor
(*ii*) Saving in work compared to single stage
(*iii*) Heat rejected in intercooler.

Or

8. (*a*) Draw and explain actual indicator diagram of reciprocating compressor. [6]

(*b*) Determine the size of the cylinders for a single acting single stage compressor consuming 35 kW. Also calculate mean effective pressure. Intake conditions are 1 bar and 15ºC and polytropic index is 1.3, speed is 100 rpm and mean piston speed is 152 m/min, delivery pressure is 6 bar. Also calculate isothermal power. Neglect clearance. [7]

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

Seat
No.

[5152]-520

S.E. (Mechanical, Mech. Sandwich and Automobile)

(II Sem.) EXAMINATION, 2017

ELECTRICAL AND ELECTRONICS ENGINEERING

(2015 PATTERN)

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

N.B. :— (*i*) Attempt Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4,**

Q. No. **5** *or* Q. No. **6,** 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*) The power input to 500 V, 50 Hz, 6 pole, 3-phase induction motor running at 975 rpm is 40 kW. The stator losses are 1 kW and friction and windage losses are 2 kW. Calculate :

(*i*) slip

(*ii*) rotor copper losses and

(*iii*) efficiency of motor.   [6]

(*b*) Why is a starter necessary for operating DC motors ? Draw neat diagram of three point starter for DC shunt motor and explain the working. Write the function of no-volt coil and overload release.   [7]

Or

2. (*a*) Differentiate between slip ring and squirrel cage induction motor. [6]

(*b*) A 250 V DC shunt motor has an armature resistance of 0.5 ohm and field resistance of 125 ohm. It drives a load at 1000 rpm and takes a current of 25 A. The field circuit resistance is then increased to 150 ohm. Calculate new speed assuming load torque to be constant. [7]

3. (*a*) Write any *six* important features of ATmega 328P micro-controller. [6]

(*b*) Elaborate the construction of variable reluctance stepper motor with the help of suitable sketches and hence explain its Full-step and Half-step modes of operations. [6]

Or

4. (*a*) Describe the constructional details and operation of shaded pole induction motor with the help of appropriate diagrams. [6]

(*b*) Draw bit pattern of status register of ATmega 328P and explain the significance of all bits. [6]

5. (*a*) Explain various timers in ATmega 328 microcontroller. [6]

(*b*) Explain the interfacing of LED with Arduino board with required functions and write an algorithm to blink an LED. [6]

Or

6. (*a*) Explain the following Arduino functions used for serial communication :

(*i*) Serial.begin( )

(*ii*) Serial.end( )

(*iii*) Serial.available( ). [6]

(*b*) Draw interfacing circuit diagram of Arduino board and LCD. Also write basic algorithm used for this interfacing. [6]

7. (*a*) List any six features of in-built ADC in ATmega 328P microcontroller. [6]

(*b*) Explain temperature measurement scheme using LM35 temperature sensor and ATmega 328P microcontroller with the help of interfacing diagram. [7]

Or

8. (*a*) Explain the format of ADCSRB and DIDRO registers mentioning the function of each bit. [6]

(*b*) Draw and explain the interfacing diagram of ATmega 328P microcontroller to control operation of DC motor using PWM. [7]

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

Seat
No.

[5152]-521

S.E. (Mechanical Sandwich) (I Sem.) EXAMINATION, 2017
MATERIAL SCIENCE AND METALLURGY
(2015 PATTERN)

Time : Two Hours   Maximum Marks : 50

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

(*ii*) Neat diagrams should be drawn wherever necessary.

(*iii*) Use of non-programmable electronic pocket calculator is allowed.

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

1. (*a*) Define the following terms :   [4]

(*i*) Space lattice

(*ii*) Unit Cell

(*iii*) Co-ordination number

(*iv*) Atomic Packing Factor.

(*b*) Explain with neat sketch Edge dislocation and Screw dislocation.   [4]

(*c*) Explain in detail with neat diagram magnetic particle crack detection method.   [4]

Or

2. (*a*) Derive an expression for relationship between true stree and engineering stress and true strain and engineering strain. [4]

P.T.O.

(*b*) What is fatigue of metals ? Explain the method of testing the metals for fatigue. [4]

(*c*) What is Burger's circuit ? Explain with neat diagram how Burger's vector is found out by using Burger's circuit ? [4]

3. (*a*) What is tool steel ? List different types of tool steel and explain different types of cold work tool steel ? [5]

(*b*) What are different types of cast iron ? Explain gray cast iron with its two applications. [4]

(*c*) What is carburising ? State different types of carburising and their advantages and limitations. [4]

Or

4. (*a*) Indicate the temperature range of the following heat treatment on Fe-Fe$_3$C equilibrium diagram and mention relative cooling rates : [5]

(*i*) Annealing

(*ii*) Normalising

(*iii*) Hardening

(*iv*) Process annealing

(*b*) Explain with examples why heat treatment of steels is done. [4]

(*c*) Explain classification of steel based on amount of de-oxidation. [4]

5. (*a*) Describe the various steps in power metallurgy with importance of each step in controlling properties of the final product. [5]

(*b*) Which method you will recommend for the manufacture of the following metal powders ? Justify your answer : [4]

(*i*) Cu

(*ii*) Fe

(*iii*) Mg

(*iv*) W

(*c*) What are different properties required in bearing material ? List two babbitt materials with their composition. [4]

Or

6. (*a*) State composition, properties and applications of the following alloys : [6]

(*i*) Gun Metal

(*ii*) Muntz metal

(*iii*) German Silver.

(*b*) Describe the effect of increasing zinc content on the properties of brasses. [3]

(*c*) Explain with neat flow diagram manufacturing of self lubricated bearings. [4]

7. (*a*) Differentiate between thermosetting and thermoplastic composites. Give minimum two examples each. [4]

(*b*) Explain various properties of ceramics and comment on corrosion resistance of ceramics as compare to metals and polymers. [4]

(*c*) What is composite ? How is it different than alloy and what role of matrix material and reinforcement in composite ? [4]

Or

8. (*a*) Briefly explain how molecular weight and degree of crystallinity influences tensile or yield strength of polymer. [4]

(*b*) Draw Rocks Salt (NaCl) and Zinc blend (ZnS) and indicate relative atom positions. [4]

(*c*) Compare between laminated and fibre reinforced composites. [4]

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

Seat
No.   **[5152]-522**

S.E. Mech S/W (First Semester) EXAMINATION, 2017
FLUID MECHANICS AND MACHINERY
(2015 PATTERN)

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

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

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

(*iii*) Use of calculator is allowed.

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

(*v*)   Solve Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q. No. **5** or Q. No. **6**, Q. No. **7** or Q. No. **8**

1. (*a*) Define viscosity, kinematic viscosity. Write its units and explain the effect of temperature on viscosity of liquid and gases.[6]

(*b*) A venturimeter of size 200 mn × 100 mm is used to measure the flow of liquid of sp.gr. 0.85. If the mercury differential manometer head is 250 mm, find the discharge through the venturimeter. Also find the absolute pressure at the throat if the pressure of the inlet is 49 KPa. Assume Cd = 0.98. [6]

Or

2. (*a*) The velocity potential function (φ) is given by :

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

(i)   Calculate the velocity components in x and y direction.

(ii)   Check possibility of fluid flow.   [6]

(b)   A circular plate of 2.5 m diameter is immersed in water. Its greatest and least depth below the surface being 3.5 m and 1.5 m respectively. Find :

(i)   Total pressure on one face of the plate

(ii)   Position of the centre of pressure.   [6]

3. (a)   Derive the Wein–Darcy's equation as :

$$h_f = \frac{4 f \, \text{L} \, \text{V}^2}{2gd}$$

where f – coefficient of friction

L – length of test section

V – velocity of flow

d – diameter of flow

and hence prove $h_f = \dfrac{\text{F} \, \text{L} \, \text{Q}^2}{12.1 \, d^5}$

where Q–discharge through pipe   [6]

(b)   A jet of water leaves the nozzles at a velocity of 40 m/s and impeges on series of curved vanes having the velocity of 20 m/s. The water jet makes an angle of 30º to the direction of motion of vanes at inlet and an angle of 130º at outlet from direction of motion of vanes. Friction factor between fluid and vanes is 0.9. Determine :

(i)   Blade angles at inlet & outlet

(ii)   Work done per Newton of water   [7]

Or

4. (*a*) Determine :

   (*i*) Pressure gradient

   (*ii*) Shear stress at the two horizontal fixed parallel plates

   (*iii*) Discharge and

   (*iv*) Mean velocity of oil flowing with maximum velocity of 2.5 m/sec. The horizontal fixed parallel plates are 150 mm apart and width is one meter. Take μ = 2.5 Pa-S [6]

   (*b*) A pelton turbine 1.6 m bucket diameter develops a power of 3600 kW at 400 rpm under a net head of 272 m. If the overall efficiency is 88% and velocity coefficient is 0.97 :

   (*i*) Speed ratio

   (*ii*) Discharge ins m³/s

   (*iii*) Diameter of nozzle

   (*iv*) Specific speed. [7]

5. (*a*) The frictional torque T of a disc of diameter D rotating at a speed N in a fluid of viscosity μ and density ρ in a turbulent flow is given by :

$$T = D^5 N^2 \rho \phi \left[\frac{\mu}{D^2 N \rho} \right]$$ [7]

   (*b*) What is draft tube ? What are its functions ? Derive the expression for efficiency of draft tube. [6]

Or

6. (*a*) Explain unit quantities as speed, discharge and power. [4]

(*b*) The following data were recorded in Fransis Turbine trial :

(*i*) Net head = 80 m

(*ii*) Speed = 750 rpm

(*iii*) Brake power = 500 kW

(*iv*) Hydraulic efficiency = 94%

(*v*) Overall efficiency = 85%

(*vi*) Flow ratio = 0.15

(*vii*) Ratio of width to diameter = 0.1

(*viii*) Inner diameter = 0.5 of outer diameter of the runner.

6% area of the runner is blocked by vanes, velocity of flow remains constant and flow is radial at exit.

Assume the flow is inward.

Find :

(*i*) Inlet & exit diameter

(*ii*) Inlet & exit width

(*iii*) Inlet grade vane angle

(*iv*) Inlet & exit vane angle [9]

7. A centrifugal pump impeller whose external and internal diameters are 400 mm and 200 mm respectively is running at 950 rpm. The rate of flow through the pump is 0.035 m³/s. The suction and delivery heads are 5 m and 30 m respectively. The diameter of the suction

and delivery pipes are 120 mm and 80 mm respectively. The diameters of the suction and delivery pipes are 120 mm and 80 mm respectively. If the outlet vane angle is 45º, the flow velocity is constant & equal to 1.8 m/s and power required to drive the pump is 15 kW. Determine :

(i)   Inlet angle

(ii) Overall efficiency

(iii) Manometric effieiency.   [12]

<center>*Or*</center>

8. (*a*) Discuss the influence of blade angles on performance of centrifugal pumps.   [6]

(*b*) What do you mean by manometric head, manometric efficiency, mechanical efficiency and overall efficiency of centrifugal pump ?   [6]

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

Seat
No.

[5152]-524

S.E. (Mechanical Sandwich) (II Semester)

EXAMINATION, 2017

METROLOGY AND QUALITY CONTROL

(2015 PATTERN)

Time : Two Hours　　　　　　　　　Maximum Marks : 50

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

(*ii*) *All* questions are compulsory i.e. (Solve Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**)

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

(*iv*) Use of calculator is allowed.

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

1. (*a*) Classify Comparators. Explain pneumatic comparator. [6]

(*b*) State precise angular measuring instruments. Explain Auto-collimator. [6]

Or

2. (*a*) What is surface texture ? With neat sketch explain any *one* method for surface finish testing. [5]

(*b*) Explain the term Maximum Metal Condition and Least metal condition related to Shaft and Hole system, also calculate the

P.T.O.

limits of tolerance and allowance for a Shaft and Hole pair designated $60H_6K_8$. Given 60 mm lies between the diameter range of 50-80 mm $i = 0.45\sqrt[3]{D} + 0.001$ D, fundamental values for tolerance grade IT 6 and IT 5 is 10 i and 7 i respectively. Fundamental deviation for shaft $d = -16D^{0.44}$. [7]

3. (*a*) How to check Major, Minor and Effective diameter of metric screw thread guage using Floating Carriage Diameter Measuring Machine. [6]

(*b*) Explain in brief the following : [6]

(*i*) Fish Bone Diagram

(*ii*) Pareto chart.

Or

4. (*a*) Explain CMM with neat sketch. [6]

(*b*) Write a short note on cost of quality and quality circle. [6]

5. (*a*) Explain TPM with example. [6]

(*b*) Write a short note on Zero defect and TS16949. [6]

Or

6. (*a*) Discuss the following quality management concept : [8]

(*i*) 5 S

(*ii*) ISO 9003

(*b*) Explain QFD. [5]

7. (*a*) Find the probability of acceptance for the lot of size 2000 fraction defective in an incoming lot is 0.3%, sample size 65 and acceptance number 2, also find AOQ. if 75 such lots is sent for sampling, how many lots will be rejected ? [6]

(*b*) Explain with neat sketches out of control patterns observed on control charts. [7]

Or

8. (*a*) Explain how to calculate process capability and control limits for variable chart. [4]

(*b*) Explain concept of acceptance sampling by referring Operational Characteristics (OC) curve. [6]

(*c*) Write a note on PPAP. [3]

Seat
No.

S.E. (Mech-SW) (Second Semester) EXAMINATION, 2017
MANUFACTURING ENGINEERING
(2015 PATTERN)

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

N.B. :— (*i*) Solve Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q.
No. **5** or Q. No. **6**, Q. No. **7** or Q. No. **8**

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

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

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

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

1. (A) What is the function of a "Pattern" ? How patterns are
classified ?   [3]

(B) Explain "Centrifugal casting process" with the help of a neat
diagram.   [3]

(C) Elaborate different "Inspection Techniques" use in casting
process.   [3]

(D) Explain working of a "Cupola" furnace with the help of a neat
diagram.   [3]

Or

2. (A) Describe and explain types of "Rolling Mills".   [3]

(B) Compare "Direct" and "Indirect" Extrusion process.   [3]

(C) Explain different "Forging" operations.   [3]

(D) How to draw a "Tube" ? Explain.   [3]

3. (A) What is the working principle of "Resistance welding" process? [3]

   (B) Explain "TIG" welding process with a neat diagram. [3]

   (C) Distinguish between "Welding, Brazing and soldering" processes. [3]

   (D) Explain "Thermit Welding Process" along with its application.[3]

Or

4. (A) Why are chucks used? List various types of lathe used in lathes. [3]

   (B) Describe the various operations which may be performed on a lathe machine. [3]

   (C) Explain "Tumbler Gear Mechanism". [3]

   (D) What is tool life? Also state the importance of calculation of tool life. [3]

5. (A) What is a 'Multispindle Drilling Machine'? What main advantages it offers? [5]

   (B) Describe with a neat sketch 'Radial Drilling Machine'? What main advantages it offers? [5]

   (C) What is a 'twist drill'? Make a neat sketch of a twist drill and show its different parts on it. [3]

Or

6. (A) Sketch and describe "Drum Type Milling Machine." [5]

   (B) Write short notes on the following milling operation : [5]
      (*i*) End milling
      (*ii*) Profile milling

   (C) What is indexing? [3]

7. (A) What are merits and demerits of "AJM" as compared to other non-conventional machining processes ? [5]

(B) Explain the construction and working of "ECDM" with the help of a neat diagram. [5]

(C) Draw a neat sketch on USM Process. [3]

Or

8. (A) Differentiate between EBM Process and ECM Process. [5]

(B) Explain the construction and working of "LBM" with the help of a neat diagram. [5]

(C) How to calculate MRR of ECM Process. [3]

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

S.E. (E&TC/Electronics) (I Sem.) EXAMINATION, 2017
SIGNALS AND SYSTEMS
(2015 PATTERN)

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

N.B. :— (*i*)   Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**

          Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

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

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

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

1.   (*a*)   Find whether the following signals are energy or power and
         find the corresponding value :   [4]

$$x(t) = \cos(t).$$

    (*b*)   Determine whether the following LTI system described by impulse
         response $h(t) = e^{-t} u(t + 1)$ is stable and causal.   [4]

    (*c*)   Find odd and even components of the following signals : [4]

$$x[n] = \{1, 0, -1, 2, 3\}$$

Or

2.   (*a*)   An analog signal is given by the equation :   [2]

$$x(t) = 2 \sin 400\, \pi t + 10 \cos 1000\, \pi t.$$

      It is sampled at sampling frequency 1000 Hz :

    (*i*)   What is the Nyquist rate for the above signal ?

    (*ii*)   What is the Nyquist interval of the signal ?

(*b*) Determine the convolution sum of the following sequence using equation of convolution sum :   [6]

$$x(n) = \delta(n) + 2\delta(n - 2)$$
$$h(n) = 2\delta(n) - \delta(n - 2).$$

(*c*) Check whether the following singal is periodic or non-periodic. If periodic, find period of the signal :   [4]

$$x(t) = 10 \sin 12\pi t + 4 \sin 18\pi t.$$

3. (*a*) State and prove the following properties of CTFT :   [6]

(*i*) Time scaling

(*ii*) Time shifting.

(*b*) Obtain the trigonometric Fourier series of the rectangular pulse shown in Fig. 1 :   [6]
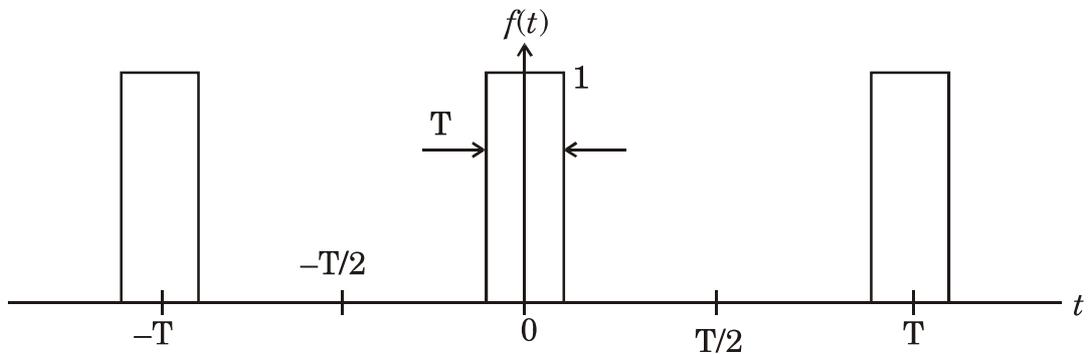
Fig. 1

Or

4. (*a*) State the Dirichlet conditions for existence of Fourier series.   [4]

(*b*) For the sinc function shown in Fig. 2, obtain Fourier transform and plot its spectrum : [8]
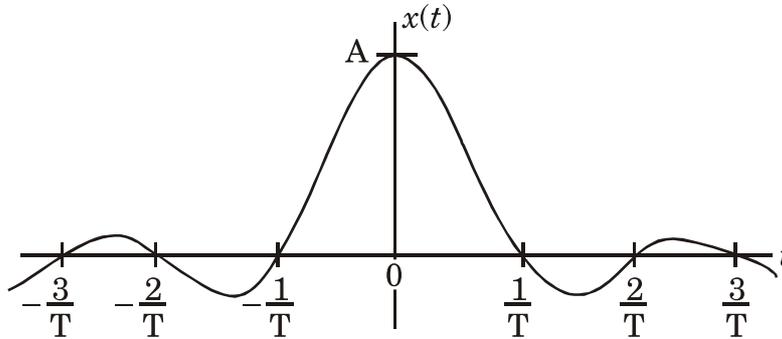
Fig. 2

5. (*a*) Find the initial and final value of a signal : [6]

$$X(s) = (s + 10)/(s^2 + 2s + 2).$$

(*b*) Find the inverse Laplace transform of : [7]

$$X(s) = -5s - 7/(s + 1)(s - 1)(s + 2).$$

Or

6. (*a*) Find the Laplace transform of the following with ROC : [7]

(*i*) $x(t) = u(t - 5)$

(*ii*) $x(t) = e^{-at} \sin(\omega t) u(t).$

(*b*) The differential equation of the system is given by : [6]

$$dy(t)/dt + 2y(t) = x(t).$$

Determine the output of system for $x(t) = e^{-3t} u(t)$. Assume zero initial condition.

7. (*a*) What is correlation ? Explain the *two* types of correlations with a practical application for each. [6]

(*b*)   The PDF of a random variable x is given by :   [7]

$f_x(x) = 1/2\pi$ for $0 \le x \le 2\pi$

$\qquad\quad = 0$ otherwise.

Calculate mean value, mean square value, variance and standard deviation.

Or

8. (*a*)   In a pack of cards, 2 cards are drawn simultaneously. What is the probability of getting a queen, jack combination ? [6]

(*b*)   Supose that a certain random variable has a CDF :   [7]

$F_x(X) = 0$ for $x \le 0$

$\qquad\quad = kx^2$ for $0 \le x \le 10$

$\qquad\quad = 50k$ for $x > 10$

(*i*)   Determine the value of k

(*ii*) $P(4 \le x \le 7)$

(*iii*) Find and sketch PDF.

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

Seat
No.

[5152]-532

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

ELECTRONIC DEVICES AND CIRCUITS

(2015 PATTERN)

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

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

     (ii) Neat diagram must be drawn wherever necessary.

     (iii) Use of logarithmic tables, slide rule, Mollier chart,
           electronic pocket calculator and steam tables is allowed.

     (iv) Assume suitable data wherever required.

1.   (A)   Draw drain and transfer characteristics of N-channel JFET and
              state various JFET parameters.   [6]

        (B)   For the circuit diagram shown in Fig. (1), the transistor : [6]
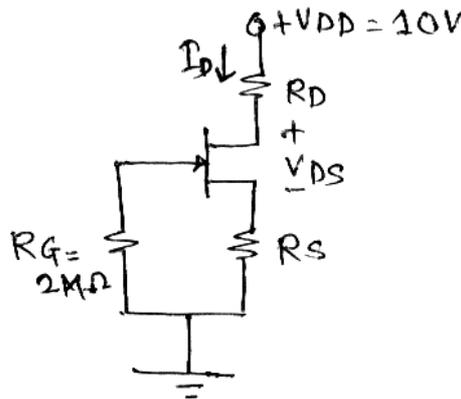
Fig. 1

        Parameters are : I_{DSS} = 5 mA, $V_{GS\ (off)}$ = −4 V.

        Calculate the values of R_D & R_S for I_D = 2 mA and
        V_{DS} = 6 V.

[5152]-532   1   P.T.O.

2. (A) Draw and explain the frequency response of JFET CS Amplifier. [6]

(B) For the circuit shown in Fig. (2), Calculate A_V, R_i, R_o [6]

$g_m = 1.5 mA/V$, $r_d = 40 k\Omega$
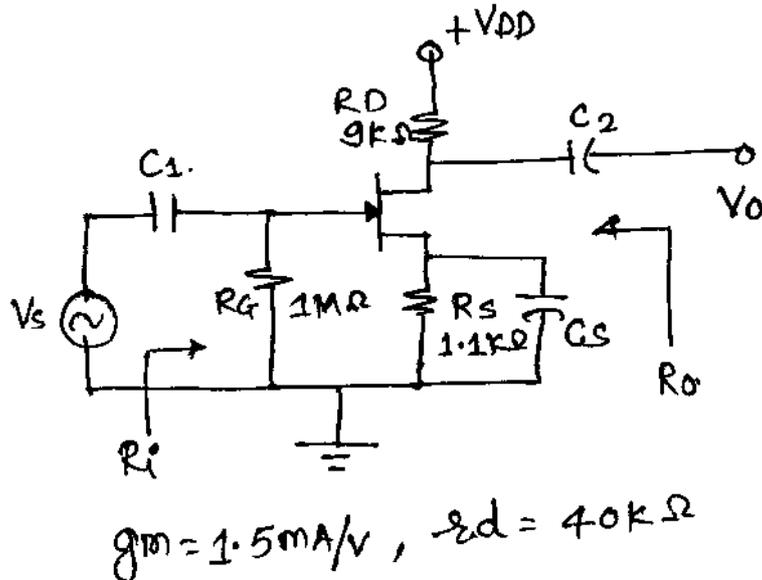
Fig. 2

3. (A) For NMOS E mode device $V_{TN} = 0.8V$, $K_n = 0.1 mA/V^2$. The device is biased at $V_{GS} = 2.5$ V.

Calculate I_D when $V_{DS} = 2V$ & $V_{DS} = 10V$.

for (*a*) $\lambda = 0$, (*b*) $\lambda = 0.02V^{-1}$

Calculate r_o for (*a*) & (*b*) [6]

(B) Draw and explain the CMOS Inverter with Active load. [6]

Or

4. (A) Write short note on MOSFET Scaling. [6]

(B) Explain the working of a MOSFET as diode. [6]

5. (A) State the advantages and disadvantages of –ve feedback amplifier. [4]

(B) Compare various feedback topologies on the basis of R_i & R_o. [4]

(C) Draw the circuit diagram of Hartley oscillator and calculate f_0 for Hartley oscillator with $L_1 = L_2 = 100$ µH and $C = 0.05$ µF. [5]

Or

6. (A) In single stage voltage amplifier $A_V = -20$, $R_i = 1M\Omega$, $R_o = 8k$, 20% O/P voltage is feedback in series with i/p. Determine A_{vf}, R_{if}, R_{of} of –ve feedback amplifier. [6]

(B) Write a short note on Colpitts oscillator using FET. [7]

7. (A) Draw and explain the block diagram of LM 317 and also state specification of LM 317. [8]

(B) Define line and load regulation in case of voltage regulator. What are the ideal values of the same ? [5]

Or

8. (A) For the circuit diagram as shown in the Fig. (3) calculate range of O/P voltage. (Assume Iadj = 50 µA) [4]
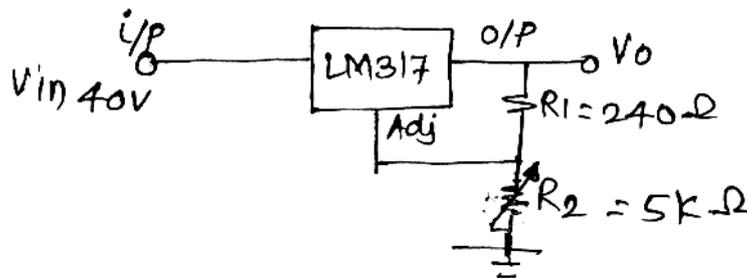
Fig. 3

(B) Draw and explain the step down switching regulator. [5]

(C) Write short note on current boosting regulator. [4]

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

Seat
No.

[5152]-533

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

ELECTRICAL CIRCUITS AND MACHINES

(2015 PATTERN)

Time : Two Hours Maximum Marks : 50

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

(ii) Figures to the right indicate full marks.

(iii) All questions carry equal marks.

(iv) You are advised to attempt not more than 4 questions.

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

(vi) Assume suitable data, if necessary.

1. (a) Apply Mesh Analysis & determine current I_1 & I_2 : [7]
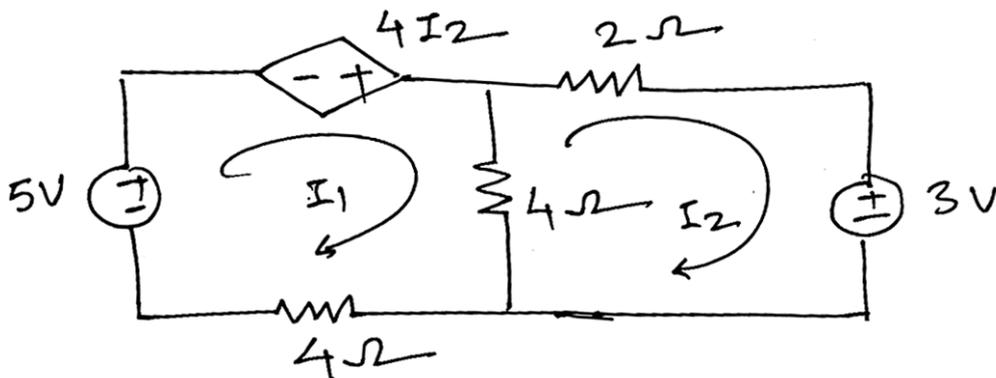
(b) Explain construction & working principle of current transformer. [5]

Or

2. (*a*) State and explain Maximum power transfer theorem.   [4]

(*b*) The following readings were obtained from O.C & S.C tests on 8 KVA, 400/120 V, 50 Hz transformer :   [8]

O.C. test on LV side   120 V   4 A   75 W

S.C. test on HV side   9.5 V   20 A   110 W

Calculate the voltage regulation & efficiency at full load, 0.8 P.f. lagging.

3. (*a*) Explain the characteristics of D.C shunt motor. Comment on p.f.   [5]

(*b*) Output of 3φ, 415 V Induction Motor running at 2% slip is 36.775 kW. Determine :   [8]

(*i*)   Rotor speed & Slip speed

(*ii*) Rotor O/P & rotor copper loss

(*iii*) Efficiency of motor at given loading conditions.

Assume Motor is wound for 4-pole & supply frequency to be 50 Hz. Given friction & windage losses are 1500 W while stator losses are 3 kW.

Or

4. (*a*) Explain Torque-slip characteristics of 3φ Induction Motor. Explain the effect of Rotor resistance on its characteristics with the help of diagram.   [7]

(*b*)   A 4 pole, 250 V DC series Motor has wave connected armature winding with 1254 conductors. The flux pole is 22 mWb when the motor is taking 50 A. The armature & series field coil resistances are 0.3 Ω & 0.2 Ω. Calculate the speed & Torque of the motor & also power developed in watts.   [6]

5. (*a*)   What are Brushless Motors ? Explain with neat diagram. Explain the operation of unipolar brushless DC Motor.   [6]

(*b*)   Explain construction, principle & applications of Reluctance Motor.   [7]

Or

6. (*a*)   Compare Brushless DC Motor with conventional DC Motor.   [6]

(*b*)   What are Universal Motors ? Explain speed-torque characteristics of compensated type & non-compensated type Universal Motor.   [7]

7. (*a*)   What are Stepper Motors ? Explain any *one* type in detail. State its applications.   [6]

(*b*)   Compare variable reluctance motor with permentent magnet stepper motor.   [6]

Or

8. (*a*) Explain construction & working of AC Servomotor. State its applications. [6]

(*b*) What are Induction Motors ? Explain operating principle of shaded 1ϕ Induction Motor. [6]

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

Seat
No.

[5152]-534

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

DATA STRUCTURES AND ALGORITHMS

(2015 PATTERN)

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

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

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

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

1.   (*a*)   Sort the following data using merge sort and selection sort. [6]

142   317   45   222   187

(*b*)   What will be the output of the following code ? Justify your
answer.   [6]

```
for(i=0;i<4;i++)
{
    for(j=0;j<4;j++)
    {
        a[i][j]=20 * (i+j);
        printf("%d",a[i][j]);
    }
        printf("\n");
}
printf('%d%d",i,j);
```

Or

2. (*a*) Write the following functions in 'C' : [6]

(*i*) STRCOPY( ) To copy a string to another string using array.

(*ii*) STRLENGTH( ) To find length of string using array.

Note : Do not use standard library functions.

(*b*) Explain Algorithm Binary search with example. [6]

3. (*a*) Convert the given infix expression to postfix expression using stack. [5]

(a$b)*c–d/d

Note : $ = Exponent operator

(*b*) Define Queue and explain any *one* application of Queue. [4]

(*c*) Differentiate Singly Linked List and Doubly Linked List. [4]

Or

4. (*a*) Write a 'C' function to delete a number from singly linked list. [5]

(*b*) Explain Stack operations PUSH and POP with example. [4]

(*c*) Compare array and linked list. [4]

5. (*a*) Construct the binary search tree from the following elements :

12, 8, 25, 14, 9, 6, 18.

Also show preorder, inorder and postorder traversal for the same. [6]

(*b*) Define Binary Tree. Name and explain with suitable example the following terms :

(*i*) Root node

(*ii*) Left sub-tree and Right sub-tree

(*iii*) Depth of tree. [6]

Or

6. (*a*) Define the following terms with example with respect to Binary Tree :

(*i*) Strictly Binary Tree

(*ii*) Completely Binary Tree

(*iii*) Binary Search Tree. [6]

(*b*) Explain the different cases to delete an element from binary search tree. [6]

7. (*a*) Explain with suitable example, BFS and DFS traversal of a graph. [6]

(*b*) What is MST ? Explain with suitable example Kruskal's Algorithm to find out MST. [7]

Or

8. (*a*) Explain with suitable example the techniques to represent a Graph.

Note : Consider Graph of minimum 6 vertices. [6]

(b)
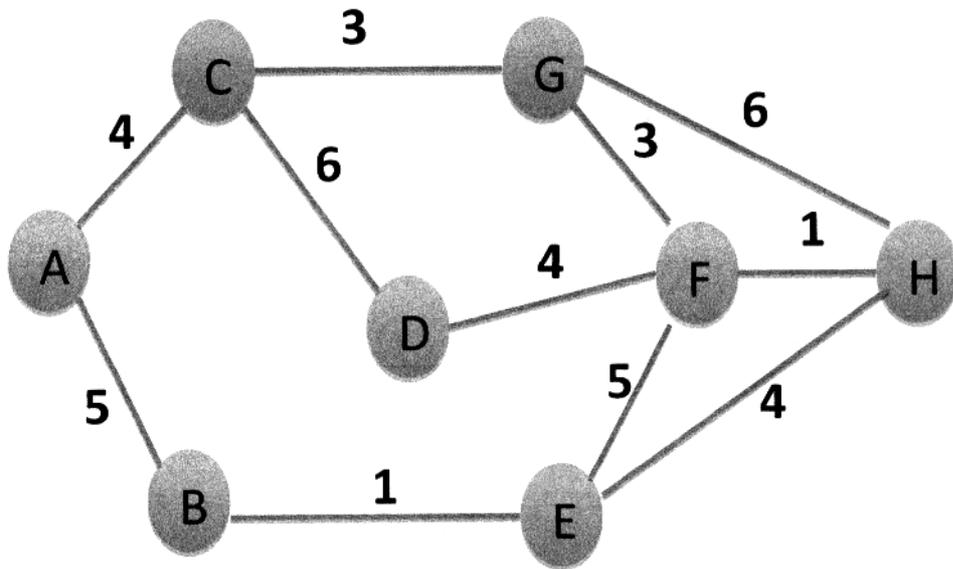
Fig. 1

Find shortest path from node A to all nodes in the graph shown in Fig. 1 using Dijkstra's algorithm. [7]

Seat No.	

[5152]-535

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

DIGITAL ELECTRONICS

(2015 PATTERN)

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

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

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

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

　　　　 (*iv*) Use of calculator is allowed.

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

1. (*a*) Design 3-bit binary to gray code converter. [6]

   (*b*) Design MOD-6 synchronous counter using Toggle FF(T FF). [6]

2. (*a*) Design 3-bit parity generator for even parity bit. [6]

   (*b*) Convert SR FF to JK FF. [6]

3. (*a*) Design a sequential circuit for the given state diagram using

delay flip-flop (D FF). [6]
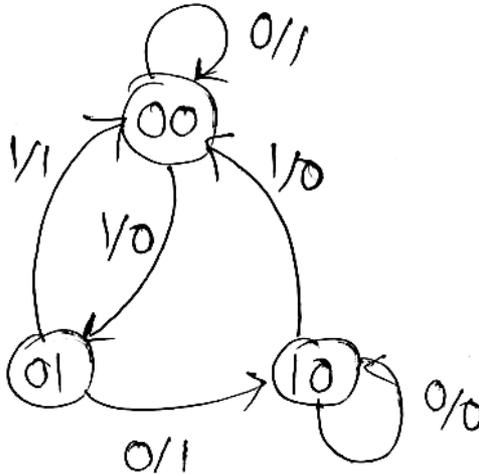
(b) Draw and explain working of two input TTL NAND gate and list advantages of totem pole output stage. [6]

4. (a) Design mealy type sequence detector to detect a serial input sequence of 1101 using Delay FF (D-FF). [6]

(b) Draw and explain two input CMOS NAND gate. [6]

5. (a) Implement the following functions using PLA : [6]

$$F_1 = \Sigma m(0, 2, 5, 7)$$
$$F_2 = \Sigma m(2, 3, 4, 5)$$

(b) Compare PROM, PLA and PAL. [4]

(c) Classify memories on the basis of principle of operation. [3]

6. (a) Draw circuit of one cell of static RAM and explain its working. [6]

(*b*)   Draw and explain architecture of PLA.   [4]

(*c*)   Explain how will you expand memory capacity (word size).   [3]

7.   (*a*)   Explain the following pins of 8051 (any *three*) :   [6]

       (*i*)   PSEN(active low)

       (*ii*)   EA (active low)

       (*iii*)   ALE

       (*iv*)   RST

(*b*)   Explain any *four* multi-function pins of port-3 of 8051.   [4]

(*c*)   List out features of 8051.   [3]

8.   (*a*)   Explain the following instructions with example (any *three*) :   [6]

       (*i*)   MOVX A,@DPTR

       (*ii*)   ADDC A,B

       (*iii*)   MUL AB

       (*iv*)   RETI.

(*b*)   Draw and explain block diagram of 8051 in detail.   [4]

(*c*)   Write a program for 8-bit multiplication of binary numbers.   [3]

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

[5152]-537

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

CONTROL SYSTEM

(2015 PATTERN)

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

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

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

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

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

1.   (A)   Obtain the transfer function of system representd by the signal flow graph shown in figure no. 1.   [6]
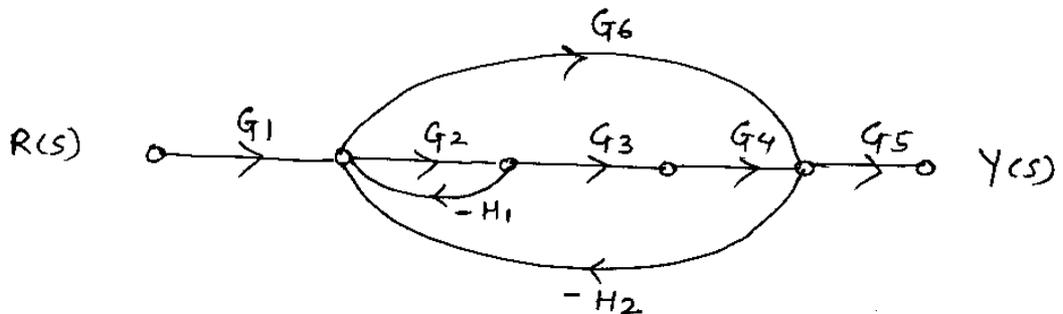
Fig. 1

(B)   For the system with closed loop transfer function

$$G(s) = \frac{25}{s^2 + 8s + 25}$$

determine damping factor, undamped natural frequency, rise time, peak time, peak overshoot and settling time with 2% tolerance band.   [6]

Or

2. (A) Obtain the transfer function of system represented by the block diagram shown in Figure No. 2. [6]
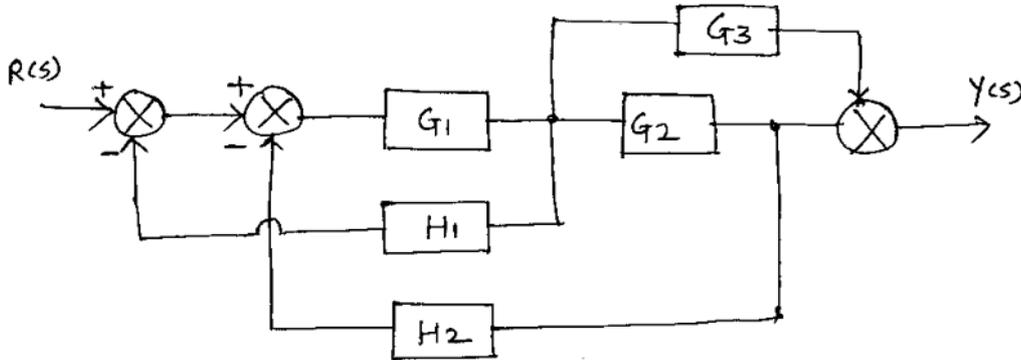
Fig. 2

(B) For the unity beedback system with open loop transfer function

$$G(s) = \frac{100(s+2)}{s(s+5)(s+10)},$$

determine static error constants and steady state error if input is $r(t) = 1 + t$. [6]

3. (A) Investigate the stability of a system having closed loop characteristic equation : [4]

$$Q(s) = s^3 + 7s^2 + 10s + k = 0 \text{ and}$$

find K_{mar} and W_{mar}.

(B) For the unity feedback system with open loop transfer function

$$G(s) = \frac{20}{s(s+1)(s+10)},$$

sketch Nyquist plot and investigate stability. [8]

Or

4. (A) Determine damping factor, undamped natural frequency, resonant peak and resonant frequency for the system with closed loop transfer function : [4]

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

(B) Sketch root locus of a system with open loop transfer function

$$G(s)\ H(s) = \frac{K}{s(s+4)(s+6)}.$$ [8]

5. (A) Obtain controllable canonical and observable canonical state models for the system with transfer function :

$$G(s) = \frac{s^2 + 3s + 5}{s^3 + 5s^2 + 2s + 9}.$$ [6]

(B) Investigate for complete state controllability and state observability of system with state space model matrices :

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -5 & -1 & -2 \end{bmatrix}, \ B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \ C = \begin{bmatrix} 1 & 0 & 2 \end{bmatrix}$$ [7]

Or

6. (A) Derive formula of state transition matrix and state any *four* properties. [7]

(B)   Obtain physical variable state model of the system shown in Figure No. 3.   [6]
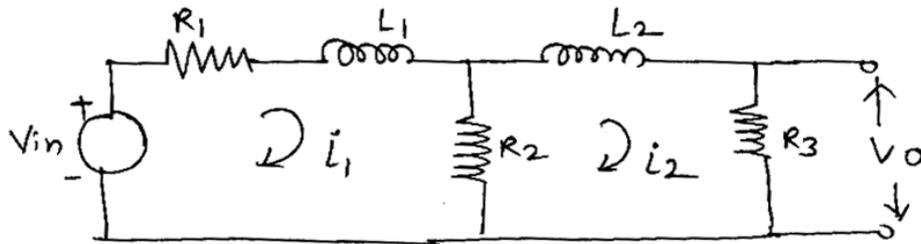
Fig. 3

7.   (A)   Determine pulse transfer function of a system shown in Figure No. 4, using first principle (starred Laplace transform)   [7]
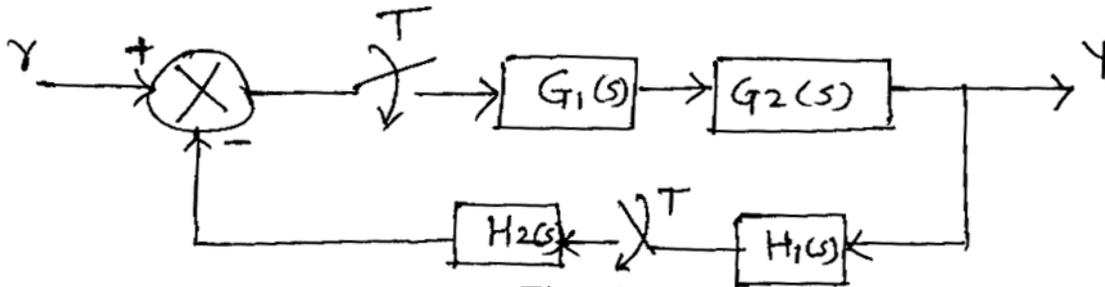
Fig. 4

(B)   Sketch step and ramp responses of P, PI & PID control actions.   [6]

Or

8.   (A)   Determine pulse transfer function of a system shown in Figure No. 5.   .[7]
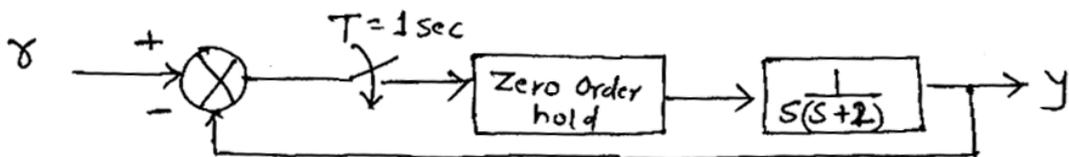
Fig. 5

(B) Obtain ladder diagram for a 3-input two output system with boolean expressions : [6]

$Y_1 = A \overline{B} C + A B \overline{C}$

$Y_2 = \overline{A} \overline{B} \overline{C} + A B.$

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

Seat
No.   **[5152]-538**

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

EXAMINATION, 2017

ANALOG COMMUNICATION

(2015 PATTERN)

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

N.B. :— (*i*) Attempt Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**,

Q. No. **5** or Q. No. **6** and Q. No. **7** or Q. No. **8**.

(*ii*) 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 table is allowed.

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

1. (*a*) Distinguish clearly between Baseband communication and carrier

communication.   [6]

(*b*) Sketch AM signal for the given periodic triangle signal *m*(*t*)

corresponding to :   [6]

(*i*) *m* = 0.5

P.T.O.

(*ii*)   *m* = 1

(*iii*)   *m* = 2

(*iv*)   *m* = ∞ ?

Or
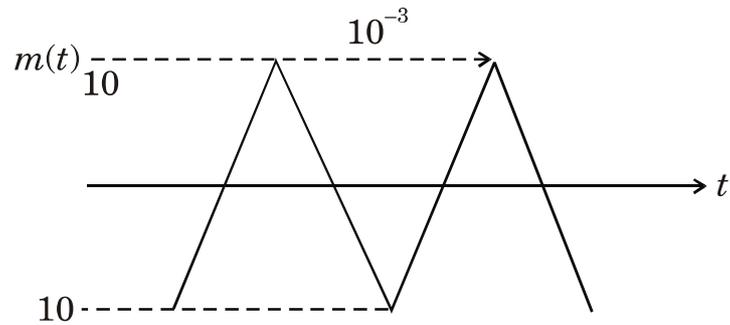
2.   (*a*)   Explain the following performance characteristics of receiver with response curve ?   [6]

        (*i*)   Sensitivity

        (*ii*)   Selectivity

        (*iii*)   Fidelity

        (*iv*)   Image frequency rejection.

   (*b*)   A receiver tunes signal from 3 MHz to 30 MHz with an IF of 455 kHz. Find the frequency tuning ranges and capacitor tuning ranges for the oscillator section and RF section. [6]

3.   (*a*)   Give comparison between FM and PM ?   [6]

   (*b*)   Describe Armstrong method for Indirect FM generation of wideband angle modulation signals.   [6]

Or

4. (*a*) Discuss principle working of FM detection. Briefly explain any *one* FM detector method. [6]

(*b*) Justify "Ratio detector acts as Detector as well as limiter" ? [6]

5. (*a*) Draw equivalent sources for thermal noise (voltage and current) and derive the expression for rms noise voltage and rms noise current. [6]

(*b*) Three resistors of 33 kΩ, 56 kΩ and 75 kΩ are at 310.5 °K temperature. For a B.W. of 100 kHz, calculate thermal noise voltage generated by : [7]

(*i*) Each resistor

(*ii*) The three resistors in series

(*iii*) Resistor combination as shown ?
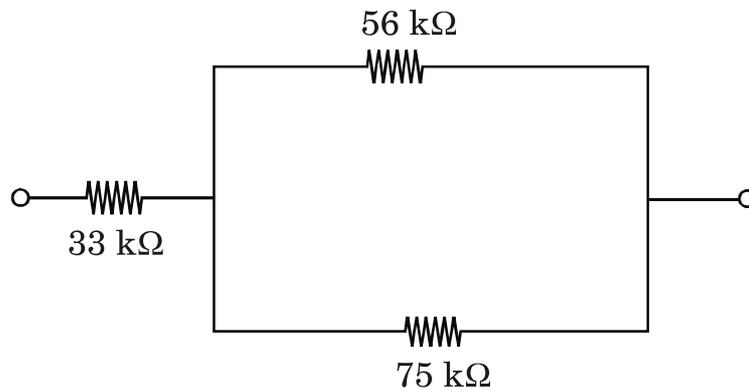
Or

6. (*a*) Derive expression for Friss formula for noise factor of amplifier in cascade. [7]

(*b*)   A mixer stage has noise figure of 28 dB, and these is preceded by an amplifier that has noise figure of 7 dB and an available power gain of 20 dB. Calculate the overall noise figure referred to the input. [6]

7.   (*a*)   State and prove sampling theorem for band limited signal. [7]

   (*b*)   Compare PAM, PWM and PPM. [6]

Or

8.   (*a*)   Describe with suitable block diagram pulse code modulation. [7]

   (*b*)   What is meant by "Aperture Effect" ? How can it be reduced ? [6]

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

Seat
No.

[5152]-541

S.E. (Electrical & Instru.) (I Sem.) EXAMINATION, 2017

ENGINEERING MATHEMATICS—III

(Common With Instru. & Control)

(2015 PATTERN)

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

N.B. :—   (*i*)   Figures to the right indicate full marks.

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

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

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

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

(*i*) $(D^2 + D + 1)y = x \sin x$

(*ii*) $(2x + 3)^2 \dfrac{d^2y}{dx^2} - 2(2x + 3)\dfrac{dy}{dx} - 12y = 6x$

(*iii*) $(D^2 + 3D + 2)y = \sin e^x$

using method of variation of parameters.

(*b*)   Solve the following differential equation by using Laplace

transform :   [4]

$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = te^{-t}, \ y(0) = 1, \ y'(0) = -2.$$

P.T.O.

Or

2. *(a)* An electric current consists of an inductance 0.1 henry a resistance R of 20 ohms and a condenser of capacitance C of 25×10^{-6} farads. If the differential equation of electric circuit is :

$$L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = 0,$$

then find the charge q and current p at any time t given that at t = 0, q = 0.05 columbs, i = 0. [4]

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

(*i*) Find $L\left[\int_0^t \frac{\sin t}{t}\,dt\right]$

(*ii*) Find $L^{-1}\left[\frac{3s+1}{(s+1)^4}\right]$

(c) Evaluate the following integral using Laplace transform : [4]

$$\int_0^\infty t\,e^{-3t}\sin t\,dt.$$

3. *(a)* Find inverse sine transform if : [4]

$$F_s(\lambda) = \frac{1}{\lambda}e^{-a\lambda}.$$

(b) Attepmt any *one* :   [4]

    (*i*)   Find *z*-transform of

$$f(k) \; = \; \frac{2^k}{k!}, \; \; k \; \geq \; 0.$$

    (*ii*)   Find the inverse *z*-transform of :

$$\frac{z(z+1)}{z^2 - 2z + 1}, \; \; |z| \; > \; 1.$$

(c) Find directional derivative of   [4]

$$\phi \; = \; xy^2 \; + \; yz^3$$

at (1, −1, 1) along the vector

$$i \; + \; 2j \; + \; 2k.$$

Or

4. (*a*) Attempt any *one* :   [4]

    (*i*)   Prove that :

$$\bar{b} \times \nabla \left(\bar{a} . \nabla \log r \right) = \frac{\bar{b} \times \bar{a}}{r^2} - \frac{2\left(\bar{a} . \bar{r} \right)\left(\bar{b} \times \bar{r} \right)}{r^4}.$$

    (*ii*) $\nabla \times \left(\dfrac{\bar{a} \times \bar{r}}{r^3} \right) = \dfrac{-\bar{a}}{r^3} + \dfrac{3\left(\bar{a} . \bar{r} \right)\bar{r}}{r^5}.$

[5152]-541   3   P.T.O.

(b)   Show that :   [4]

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

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

(c)   Obtain $f(k)$ given that :   [4]

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

5.   Attempt any *two* :

(a)   Verify Green's theorem in plane for   [6]

$$\int_C \left(xy + y^2\right)dx + x^2 dy$$

where C is the boundary of the closed region bounded by
$y = x$ and $y = x^2$.

(b)   Evaluate :   [6]

$$\iint_S \left(xi + yj + z^2 k\right). \, d\overline{S}$$

where S is the curved surface of the cylinder

$$x^2 + y^2 = 4$$

bounded by the planes $z = 0$ and $z = 2$.

[5152]-541   4

(*c*)   Verify Stokes' theorem for

$$\bar{F} = (2x - y)i - yz^2 j - y^2 z k$$

over the surface of hemisphere

$$x^2 + y^2 + z^2 = 1$$

above the *xoy* plane.   [7]

Or

6.   Attempt any *two* :

(*a*)   Find the work done in moving a particle from $(1, -2, 1)$ to $(3, 1, 4)$ in a force field   [6]

$$\bar{f} = (2xy + z^3)i + x^2 j + 3xz^2 k$$

(*b*)   Prove that :   [6]

$$\iiint\limits_{V} \frac{1}{r^2} dV = \iint\limits_{S} \frac{1}{r^2} \bar{r} \cdot d\bar{S}$$

where S is closed surface enclosing the volume V. Hence evaluate :

$$\iint\limits_{S} \frac{xi + yj + zk}{r^2} \cdot d\bar{S}$$

where S is surface of the sphere

$$x^2 + y^2 + z^2 = a^2.$$

(c) Verify Stokes' theorem for [7]

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

where S is the hemisphere :

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

7. (a) If $\phi + i\psi$ is complex potential for an electric field (which is analytic) and

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

find the function ψ. [4]

(b) Evaluate : [5]

$$\int_C \frac{z+4}{(z+1)^2 (z+2)^2} dz,$$

where 'C' is a circle $|z + 1| = \dfrac{1}{2}$.

(c) Find the bilinear transformation, which maps point 1, 0, i of z-plane onto the points ∞, -2, $-\dfrac{1}{2}(1 + i)$ of w-plane. [4]

Or

8. (a) Show that analytic function with constant amplitude is constant. [4]

(b)   Evaluate :   [5]

$$\int_{2+4i}^{5-5i} \left(z+1\right)dz,$$

along the line joining points $(2 + 4i)$ and $(5 - 5i)$.

(c)   Find the image of Hyperbola   [4]

$$x^2 - y^2 = 1,$$

under the transformation $w = \dfrac{1}{z}$.

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

Seat
No.

[5152]-543

S.E. (Electrical) (First Semester)
EXAMINATION, 2017
ANALOG & DIGITAL ELECTRONICS
(2015 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*) Figures to the right indicate full marks.

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

(*iv*) Use of non-programmable calculator is permitted

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

1. (A) Convert the following numbers into its equivalent numbers : [6]

  (*i*) $(7BC. A3)_{16} = (\quad)_8$

  (*ii*) $(12.125)_{10} = (\quad)_2$

  (*iii*) $(754.51)_8 = (\quad)_{10}$

  (B) Write the truth table and derive excitation table for SR, JK and D flip-flops. [6]

Or

2. (A) Draw and explain 4-bit controlled buffer register. [6]

  (B) Simplify using Boolean algebra : [6]

$$D(\bar{A} + B) + \bar{B}(C + AD)$$

3. (A) Draw and explain the frequency response characteristics of an ideal and practical low pass filter. [7]

P.T.O.

(B) Draw neat diagram. Explain OPAMP as a peak detector.

[6]

Or

4. (A) List important characteristics of Comparator. What is the difference between zero crossing detector and comparator ? [7]

(B) Explain working of IC 555 as Astable Multivibrator [6]

5. (A) Write a short note on Push Pull Amplifier. [6]

(B) Draw and explain RC coupled amplifier and state its applications. [6]

Or

6. (A) Draw and explain the construction of FET with its characteristic. [6]

(B) Explain the Darlington connection and how it improves the current gain. [6]

7. (A) Draw neat diagram of the single phase half wave rectifier with R load. Define :

(*i*) Efficiency

(*ii*) Form factor

(*iii*) Ripple factor

(*iv*) Transformer utilization factor

(*v*) Peak inverse voltage and

(*vi*) Rectification efficiency. [7]

(B) With neat diagram, explain the working of full wave precision rectifier. [6]

Or

8. (A) A single phase full wave rectifier is supplied from 230 V, 50 Hz source. The load resistance is 100 ohm and diode resistance is 1 ohm, calculate :

   (*i*)   Average value of load voltage

   (*ii*) DC output power

   (*iii*) AC input power

   (*iv*) Rectification efficiency. [7]

   (B) Explain the working of single phase half wave rectifier with RL load with neat sketch and draw its waveform. [6]

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

Seat
No.

[5152]-544

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

MATERIAL SCIENCE

(2015 PATTERN)

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} coulomb.metre.

SECTION I

1. (*a*) Write short note on Polar and Non-Polar dielectric materials with examples.   [6]

   (*b*) State the properties & applications of :   [6]

   (*i*)   Pressboard

   (*ii*) Varnish.

Or

2. (*a*) What are different mechanisms of polarization ? Explain any *two* with diagram. [6]

(*b*) Explain various factors which affect breakdown in solid insulating materials. [6]

3. (*a*) What do you mean by spontaneous magnetization ? Hence derive Curie-Weiss law for ferromagnetic materials. [6]

(*b*) Write materials used for Super-capacitors, Solders and Super Conductors. [6]

Or

4. (*a*) In a magnetic material, an application of a magnetic field of 3×10^5 A/m results into a flux density of 1.2 tesla. Calculate its permeability, susceptibility & magnetisation. [6]

(*b*) Describe properties and applications of Kanthal and Bronze. [6]

5. (*a*) Describe with neat diagrams : [8]

(*i*) Molecular Machines

(*ii*) Single Electron transistor

(*b*) What are different types of batteries used in electric hybrid vehicles ? Write their properties. [5]

Or

6. (*a*) Explain with neat diagram – BN Nanotubes. [7]

(*b*) Explain with neat diagram, chemical reaction and applications of : [6]

(*i*) Lithium-ion

(*ii*) Sodium-Sulphur.

7. (*a*) With neat circuit diagram & phasor diagram, explain measurement of dielectric loss angle (tan δ) by Schering Bridge as per IS 13585-1994. [7]

(*b*) With neat sketch, explain how flux density is measured with the help of Gauss meter. [6]

Or

8. (*a*) Explain the step by step method of finding dielectric strength of transformer oil with a neat diagram as per IS 6798. [6]

(*b*) Explain the method of finding dielectric strength of air using sphere gap voltmeter with a neat diagram as per IS 2584. [7]

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

Seat
No.

[5152]-545

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

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

(2015 PATTERN)

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

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

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

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

(*iv*) Assume suitable data if necessary.

1. (*a*) What are shunts ? Explain working of universal shunt with neat diagram for extension of range of instrument. [6]

(*b*) With neat diagram, derive general equation for a.c. bridge balance hence determine value of unknown impedance to balance the bridge if three arms of bridge consist of impedances as follows [6]

$$Z_1 = 50 \ \angle 80°\Omega, \ Z_2 = 125 \ \angle 0°\Omega \ \text{and} \ Z_3 = 200 \ \angle 30°\Omega$$

Or

2. (*a*) With neat diagram, explain working of Kelvin's Double Bridge for measurement of low resistance. Derive relation for finding unknown resistance. [6]

P.T.O.

(*b*) With neat diagram, explain construction and principle of attraction type moving iron instrument. [6]

3. (*a*) With neat circuit, explain construction and working of power analyser. [6]

(*b*) A 230 V, 50 Hz single phase energy meter has a constant of 200 revolutions per kWh while supplying a non-inductive load of 4.4 A at normal voltage, the meter takes 3 minutes for 10 revolutions. Calculate the percentage error of the instrument and state that whether energy meter is running slow or fast. [7]

Or

4. (*a*) In a three phase circuit, two wattmeters used to measure power indicate 1200 W and 600 W respectively. Find total active power, reactive power and power factor of circuit :

(*i*) When both wattmeter readings are positive

(*ii*) When the latter is obtained by reversing the current coil connections [7]

(*b*) Explain how the following adjustments are made in single phase induction type energy meter : [6]

(*i*) Lag adjustment

(*ii*) Creep.

5. (*a*) Define pressure. State the importance of pressure measurement hence classify pressure in detail. [6]

(*b*) In an experiment, the voltage across 100 W incandescent bulb is applied to CRO. The screen shows a sinusoidal signal of total vertical occupancy of 3.5 cm and horizontal occupancy of 2 cm. The front panel controls volts/div and times/div are on 20 V/div and 5 ms/div respectively. Calculate : [7]

(*i*) Maximum value of voltage across bulb

(*ii*) Maximum value of current

(*iii*) Frequency.

Or

6. (*a*) With neat diagram, explain construction and working of McLeod gauge for low pressure measurement hence derive expression for unknown pressure in terms of level difference of mercury.

[7]

(*b*) Give detail classification of transducers along with suitable examples. [6]

7. (*a*) With neat diagram explain pneumatic method for level measurement. [6]

(*b*) Define strain. Give detailed classification of strain gauge. [6]

Or

8. (*a*) Explain the importance of level measurement. Explain ultrasonic method for level measurement with suitable diagram. [6]

(*b*) Explain construction and working of wire strain gauge and foil strain gauge with suitable diagrams. [6]

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

[5152]-548

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

EXAMINATION, 2017

NETWORK ANALYSIS

(2015 PATTERN)

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

N.B. :— (i) Answer Q. No. **1** or **2**, Q. No. **3** or **4**, Q. No. **5** or **6**,

  Q. No. **7** or **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) Reduce the given network figure to a single voltage source
    and impedance.   [6]
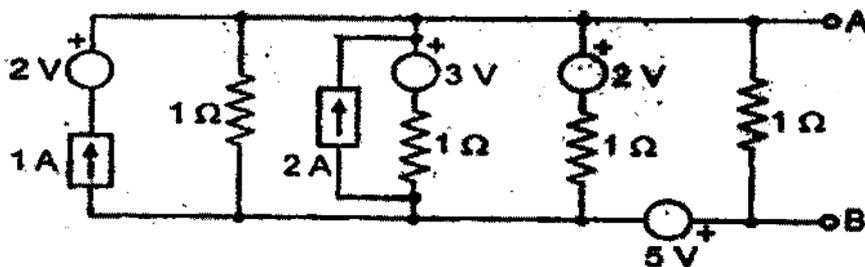
(*b*) In the circuit shown, find current I, using superposition theorem. [7]

Or
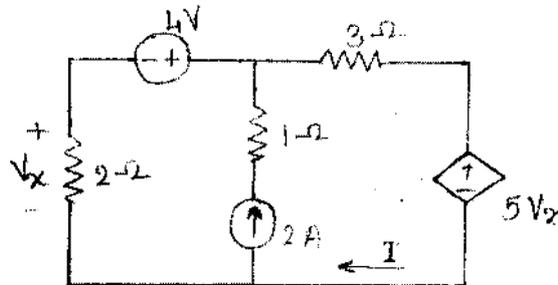
2. (*a*) Explain the following terms in relation with network graphs : [6]

(*i*) Tree

(*ii*) Cut set

(*iii*) Tie set.

(*b*) Use Thevenin's theorem to calculate current through branch A-B as shown in figure below. [7]
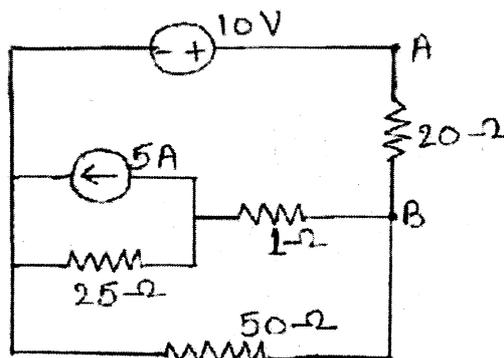
3. (*a*) As shown in circuit, switch K is changed from position 1 to position 2 at time $t = 0$, steady state condition reached before

switching. Find I, di/dt, di^2/dt^2 at $t = 0^+$. [6]
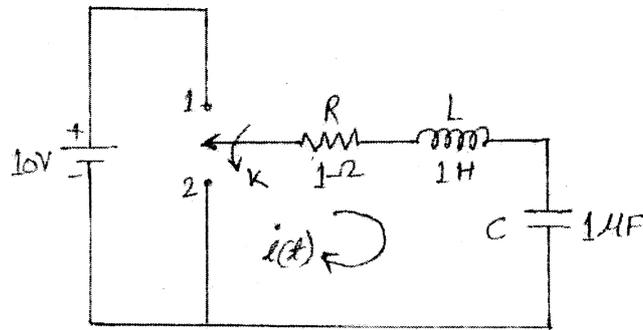
(b) Using Laplace transform find $i(t)$ in the network if initial conditions are zero. [6]

Or
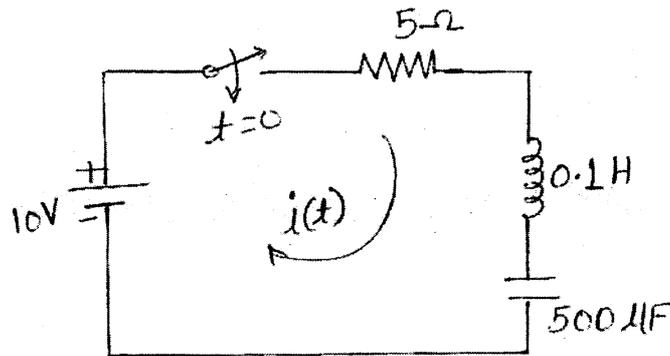
4. (a) A 5µF capacitor is initially charged with 500µC. At $t = 0$, the switch K is closed. Determine the voltage drop across the resistor at $t < \tau$ and at $t = \infty$. [6]
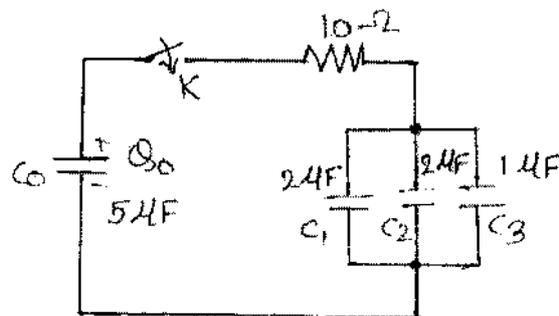
(*b*) After being on position 1 for long time, the switch is thrown on position 2 at time $t = 0$, find current using Laplace Transform technique. [6]
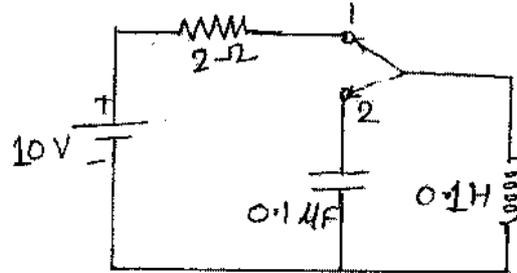
5. (*a*) Write a short note on location of poles and zeros on s-plane. [6]

(*b*) Find Z parameters for the network shown in figure. [7]
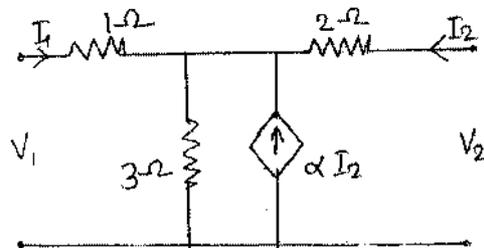
Or

6. (*a*) Find Transmission parameters for the network shown in figure. [6]
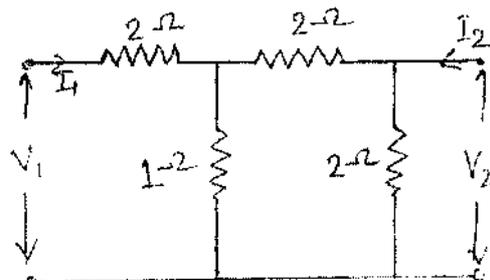
(b) Find the driving point impedance for the network shown in figure. [7]
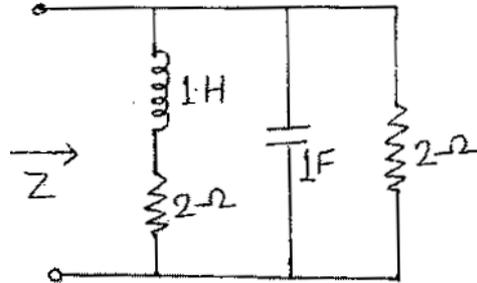
7. (a) Derive the expression for characteristic impedance (Z_0), attenuation constant (α) and phase constant (β) of prototype constant-K type low pass filter from symmetrical networks. [6]

(b) Design a T and π section Constant-K low pass filter having cut-off frequency of 2KHz and design impedance R_0 = 600Ω. Also find : [6]

(i) Its characteristic impedance at 12 KHz and

(ii) Attenuation at 4 KHz.

Or

8. (a) Explain the following terms in relation with filter : [6]

(i) Pass band

(ii) Stop band

(iii) Cut-off frequency.

(b) Design constant K-low pass filter to have a cut-off frequency of 796 Hz when terminated in a 600Ω resistance, in both the T and π configurations. [6]

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

Seat
No.

[5152]-549

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

NUMERICAL METHODS AND COMPUTER

PROGRAMMING

(2015 PATTERN)

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

N.B. :— (*i*) Attempt Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4** and 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 logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

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

1. (*a*) Find the real root of equation :

$$x^4 - 3x^3 + 3x^2 - 3x + 2 = 0$$

using Birge-Vieta method. Take $p_0 = 0.5$, show two iterations only. [6]

(*b*) What do you mean by entry control loop and exit control loop in 'C' language ? Write the syntax of any command from each type of loop. [6]

Or

2. (*a*) What are the rules to declare a variable in 'C' language ? Distinguish which of the following are valid or invalid variable names : [6]

　　(*i*)　　123 sppu

　　(*ii*)　　sppu_123

　　(*iii*)　　sppu @ 123

　　(*iv*)　　sppu123.

(*b*) Two numbers are defined with absolute error as $a \pm \varepsilon_{a1}$ and $b \pm \varepsilon_{a2}$. Prove that absolute error in $a \times b$ is $a\varepsilon_{a2} + b\varepsilon_{a1}$ and absolute error in $\dfrac{a}{b}$ is $\dfrac{b\varepsilon_{a1} - a\varepsilon_{a2}}{b^2}$. [6]

3. (*a*) Find the negative real root of equation $x^2 + 4\sin(x) = 0$, correct to three decimal places with initial value of (–2) using NR method. [6]

(*b*) Obtain the Newton's backward differences polynomial passing through all points given below : [7]

x	y
0.1	1.4
0.2	1.56
0.3	1.76
0.4	2.00
0.5	2.28

Or

4. (*a*) A series RC circuit is connected across a DC supply of 100V. Voltage across a capacitor is recorded at different instant of time. Fit the following data point into second order degree curve using least square error method : [6]

t (in msec)	v_c (in Volts)
0	0
2	33
4	55
6	70
8	80
10	85

(*b*) Find the interpolating polynomial using Newton's divided difference formula for the following table : [7]

x	y
1	0
2	7
3	26
5	125

5. (*a*) Evaluate $\int_0^{0.9} \log_e (1+\sqrt{x})dx$ using Trapezoidal rule of integration with nine subintervals. [6]

(*b*) Using modified Euler's method solve the following differential equation to find the value of y at $x = 0.1$ and 0.2 Take step size of 0.1. Allowed error is 0.0001 $\frac{dy}{dx} = 1+xy$ with $y(0) = 1$. [7]

Or

6. (*a*) Calculate following by Simpson's $\frac{3}{8}th$ rule in 8 equal intervals : [6]

$$\int_0^{\frac{\pi}{2}} e^{\sin\theta} d\theta .$$

(*b*) Use 4th order RK method to estimate $y(0.2)$ when $y' = x^2 + y^2$ with $y(0) = 0$. Take step size of 0.2. [7]

7. (*a*) Explain Gauss Jacobi method to solve linear simultaneous equations. [6]

(*b*) Find the values of x_1, x_2 and x_3 using Gauss Jordan method : [6]

$$\begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 6 \\ 4 \end{bmatrix}$$

Or

8. (*a*) Explain Gauss elimination method to solve linear simultaneous equations. [6]

(*b*) Use Gauss Seidel method to solve the following system of equations at the end of 3rd iterations. Use initial values as $x = 3$, $y = 2$ and $z = 1$: [6]

$$8x - 3y + 2z = 20$$
$$4x + 11y - z = 33$$
$$6x + 3y + 12z = 35.$$

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

Seat
No.   **[5152]-550**

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

FUNDAMENTALS OF MICROCONTROLLER AND

ITS APPLICATIONS

(2015 PATTERN)

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

N.B. :—   (*i*)   Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**,

Q. No. **5** *or* Q. No. **6**, 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 internal RAM organization of 8051 micro-
controller.   [6]

(*b*)   Explain the following instructions :   [6]

(*i*)   SUBB A,Rn

(*ii*)   JZ rel

(*iii*) MOVX A,@R1.

Or

2.   (*a*)   Explain the different flags in 8051. Show how to select bank
2 with a single instruction after power up.   [6]

(*b*)   Explain the stack organization and the stack related
instructions.   [6]

P.T.O.

3. (*a*) Write a program to clear 10 RAM locations starting at address 40 H. [6]

(*b*) State the different interrupts associated with 8051 along with interrupt vector addresses. What are the steps taken by CPU on receiving an interrupt ? [7]

Or

4. (*a*) Write a program to multiply 2 numbers stored in RAM locations 35 H and 36 H and store the result at locations 55 H and 56 H. [6]

(*b*) Explain the TMOD register. Write an assembly language program for 8051 to generate a square wave of frequency 2 kHz using timer 1, mode 1. Assume 12 MHz crystal. [7]

5. (*a*) Explain the use of assembler and simulator. [6]

(*b*) Write a program to generate triangular waveform using DAC. [6]

Or

6. (*a*) Explain the function of the following ADC pins : [6]

(*i*) SOC

(*ii*) ADD A, ADD B, ADD C

(*iii*) Output Enable.

(*b*) (*i*) Write the control word format of 8255 for the following configuration. Port A Input, Port B Output, Port C$_{upper}$ Input and C$_{lower}$ as Input.

(*ii*) Write a program to set PC$_7$ and reset it after sometime using BSR mode. [6]

7. (*a*) With the help of block diagram explain measurement of power. [6]

(*b*) With the help of block diagram and program, explain the interfacing of simple keyboard with 8051 microcontroller. [7]

Or

8. (*a*) With the help of block diagram explain measurement of power factor. [6]

(*b*) Draw block diagram and explain the DC motor interfacing to 8051 microcontroller. [7]

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

Seat
No.   **[5152]-551**

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

SENSORS AND TRANSDUCERS—I

(2015 PATTERN)

Time : Two Hours   Maximum Marks : 50

N.B. :— (*i*)   Neat diagram must be drawn wherever necessary.

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

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

1.   (*a*)   Define transducer. Explain in detail the classification of
            transducer.   [6]

     (*b*)   How strain guage is used for displacement measurement ?
            What is the necessity of temperature compensation for the
            same ?   [6]

                              Or

2.   (*a*)   Explain the following terms :   [6]

            (*i*)   Accuracy

            (*ii*) Precision

            (*iii*) Resolution

            (*iv*) Sensitivity.

     (*b*)   Explain LVDT in detail with neat diagram and draw its
            characteristics.   [6]

                                                              P.T.O.

3. (*a*) Explain the working principle of encoder with its applications. [6]

(*b*) List different techniques for torque measurement. Explain the working principle of any *one* technique in detail. [6]

Or

4. (*a*) Explain the magnetic pickup sensor for speed measurement. [6]

(*b*) Define piezoelectric effect. Explain piezoelectric sensor for force measurement with neat diagram. [6]

5. (*a*) List different types of elastic transducer for pressure measurement. Explain the working of any *one* of them. [7]

(*b*) Define gauge pressure and atmospheric pressure. Explain U tube manometer for pressure measurement with neat diagram. [6]

Or

6. (*a*) List techniques for differential pressure measurement. Explain the working of any *one* of them. [7]

(*b*) Give units of pressure. Explain the working of bourdon tube with neat diagram. [6]

7. (*a*) Explain the principle and working of pyrometer for measurement of temperature. [7]

(*b*) Explain the working principle and construction details of RTD. [6]

Or

8. (*a*) Explain working principle of thermocouple and necessity of cold junction compensation for temperature measurement. [7]

(*b*) Explain bimetallic thermometer with neat diagram. [6]

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

Seat
No.

[5152]-552

S. E. (Instrumentation and Control)
(First Semester) EXAMINATION, 2017
BASIC INSTRUMENTATION
(2015 PATTERN)

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

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

(*ii*)   Figures to the right 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*)   Discuss the types of systematic error with examples. Explain
               the measures to minimize these errors.   [6]

(*b*)   Design shunt type ohmmeter for battery voltage = 5V using
               PMMC ammeter of internal resistance 1kΩ and range of
               100 uA.   [6]

Or

2.   (*a*)   A multimeter having sensitivity of 2000Ω/V is used for
               measurement of voltage across a circuit having an output
               resistance of 10 kΩ. The open circuit voltage of the circuit
               is 6V. Find the reading of the multimeter when it is set to
               its 10 V scale. Find the percentage error.   [6]

(*b*)   Explain standardization of DC Potentiometer.   [6]

P.T.O.

3. (*a*) Explain Kelvin bridge for measurement of low resistance. [6]

(*b*) Explain the following terms with respect to Digital Storage Oscilloscope : [6]

  (*i*) Sampling Rate

  (*ii*) Bandwidth

  (*iii*) Roll mode.

Or

4. (*a*) What are Lissajous patterns ? Explain the use of it for measurement of phase and frequency with waveforms. [6]

(*b*) An AC bridge has the following constants :

Arm AB — capacitor of 0.5 uF in parallel with 1 kQ resistance.

Arm AD — resistor of 2 kQ.

Arm BC — capacitor of 0.5 uF

Arm CD — unknown capacitor C and unknown resistor R in series Frequency — 1 kHz.

AC source is connected between A and C, detector is connected between B and D. Determine unknown capacitor and dissipation factor. [6]

5. (*a*) Differentiate between Analog and Digital instruments. [6]

(*b*) Explain the construction and working of Digital pH meter. [7]

Or

6. (*a*) Explain the following specifications of Digital Multimeter with example :

  (*i*) Display Digits

  (*ii*) Resolution. [7]

(*b*) Explain the construction and working of Digital thermometer. [6]

7. (*a*) Write a note on : Virtual Instrumentation. [7]

(*b*) Explain the principle, working and applications of X-Y recorder. [6]

Or

8. (*a*) Explain the block diagram and working of Function Generator. [7]

(*b*) Explain the principle, working and applications of strip chart recorder. [6]

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

Seat
No.

[5152]-553

S.E. (Instrumentation and Control) (First Semester)

EXAMINATION, 2017

LINEAR INTEGRATED CIRCUITS

(2015 PATTERN)

Time : Two Hours   Maximum Marks : 50

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

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

(*iii*) Use of calculator is allowed.

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

1. (*a*) Define Slew Rate, Power supply Rejection Ratio and Frequency Response of an op-amp.

(op-amp = operational amplifier). [6]

(*b*) Why negative feedback is used with op-amps ?

State advantages of negative feedback. [6]

Or

2. (*a*) Draw pin diagram of IC-741 and give pin-names. [6]

(*b*) Explain concept of virtual ground with circuit diagram in brief to the point. [6]

P.T.O.

3. (*a*) Design an inverting or a non-inverting summing amplifier when the input voltages to be added/summed are : [3]

V_a = +1V,

V_b = +2V,

V_c = +3V.

Assume input side external resistors as R_a = R_b = R_c = 3 kΩ. Feedback resistor is of 1 kΩ. Let supply voltage = +/–15 V.

Determine the output voltage.

(For non-inverting amplifier assume Resistor between pin 2 and ground as 1 kΩ.)

(*b*) Draw circuit diagram for above. [3]

(*c*) Design an inverting Schmitt Trigger with Upper Trigger Point as 7.5 volts and Lower Trigger Point as –7.5 volts. Assume that saturation voltage magnitude of op-amp is 14 volts. Let maximum output voltage swing is ±14 volts.

(Draw circuit diagram.) [6]

Or

4. (*a*) Draw circuit diagram of practical integrator and practical differentiator amplifier using op-amp. [6]

(*b*) Explain how precision full wave active rectifier works. Circuit diagram essential. [6]

5. (*a*) For an astable multivibrator using IC-555, R_A = 2.2 kΩ, R_B = 3.9 kΩ and C = 0.1 μF. Determine the charging time (or ON time the time during which output is nearly V_{CC}), the discharge time (or off time, when output is zero volts) and free running frequency, f_0. [6]

Note : R_A = resistor between pin 8 and pin 7.

R_B = resistor between pin 7 and pin 6.

C = capacitor between pin 6 and ground.

(*b*) Draw circuit diagram for above design. [3]

(*c*) How monostable multivibrator is different than astable multivibrator ? Explain. [4]

Or

6. (*a*) Write a short note on IC 7805. [8]

(*b*) Write a short note on switching regulator. [5]

7. (*a*) Define filter. [2]

(*b*) How are filters classified. [4]

(*c*) List the most commonly used filters. [4]

(*d*) What are the advantages of active filters over passive ones ? [3]

Or

8. (*a*) Design a low pass filter at a cut-off frequency of 2 kHz with a passband gain of 2. (Assume first order active filter). [5]

(*b*) Design a high pass filter at a cut-off frequency of 1 kHz with a passband gain of 2. (Assume first order active filter). [5]

(*c*) Draw circuit diagram of a wide band pass filter (Assume first order active filter circuits). [3]

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

Seat
No.

[5152]-554

S.E. (Instrumentation & Control) (First Semester)
EXAMINATION, 2017
NETWORK THEORY
(2015 PATTERN)

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

N.B. :— (*i*) Assume suitable data if necessary.

(*ii*) Steps to the problems carry marks.

1. (*a*) Explain sign connections to be used in KCL and KVL. Calculate the current through resistors by Node Analysis. [6]
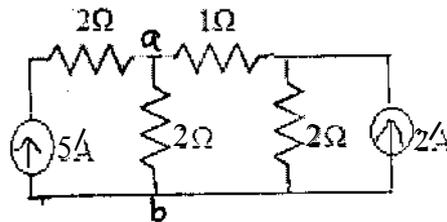
(*b*) Solve the following circuit, find voltage drop across 6Ω resistance. Use superposition theorem. [6]
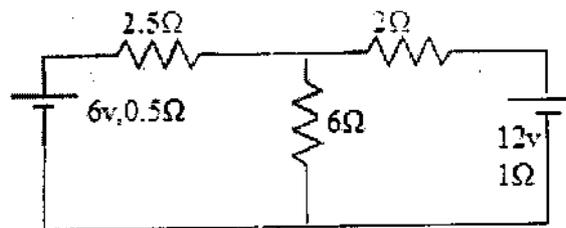
Or

2. (*a*) A 3-phase system supplies 110 V to delta connected load, whose phase impedances are $(3.54 + j3.5)$ Ω. Determine line currents and draw with phasor diagram. [6]

P.T.O.

(b) For the circuit shown below, find the value of resistance R_L that will determine the maximum power delivered to R_L. [6]
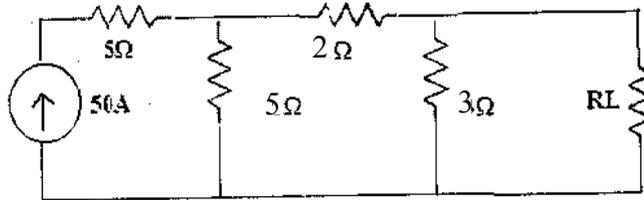
3. (a) Find driving point impedance functions- $Z_{11}(s)$ & $Z_{21}(s)$ in the following circuits. [6]
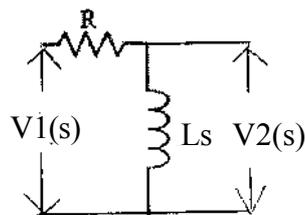
(b) Derive h parameter in terms of all other parameters. [6]

Or

4. (a) Explain the necessary conditions for driving point impedance. [6]

(b) Determine Z parameter in the circuit below : [6]
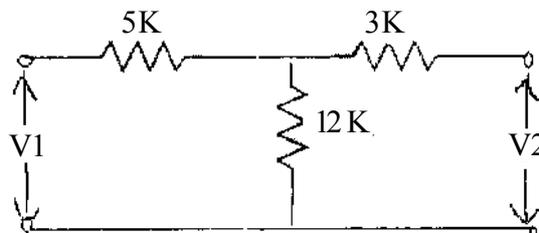
5. (*a*) Check positive realness of the following : [6]

(*a*) $\dfrac{s + 2}{s + 1}$

(*b*) $\dfrac{s^2 + 5s + 6}{s^2 + 9s + 14}$

(*b*) State and explain necessary and sufficient conditions for transfer function. [6]

Or

6. (*a*) State properties of LC driving point impedence function. [6]

(*b*) Design a band pass filter with L = 50mH, C = 127 nF, R_F = 63 ohms by calculating resonance frequency, band width and cut-off frequencies. Assume load resistance 600 ohms. [6]

7. (*a*) Derive expression for symmetrical T attenuator. Obtain design equation for the same. [6]

(*b*) Test whether the following polynomial is Hurwitz or not : [8]

(*a*) $S^4 + 7S^3 + 4S^2 + 18S + 6$

(*b*) $S^4 + S^3 + 6S^2 + 3S + 6$

(*c*) $S^4 + S^3 + 2S^2 + 4S + 1$

(*d*) $S^2 + 4S + 10$

Or

8. (*a*) Write technical notes on Hurwitz polynomial. [6]

(*b*) Realize the network having driving point impedence function : [8]

$$Z(s) = \dfrac{s^3 + 4s}{s^2 + 2}.$$

Total No. of Questions—8]

[Total No. of Printed Pages—2

Seat
No.

[5152]-557

S.E. (Instrumentation & Control) (Second Semester)
EXAMINATION, 2017
ELECTRONIC INSTRUMENTATION
(2015 PATTERN)

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

N.B. :— (*i*) Neat diagram must be drawn wherever necessary.

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

(*iii*) 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*) Describe the following modes of counter with the help of a neat diagram.   [6]

(*i*) Period Mode

(*ii*) Frequency Ratio Mode

(*b*) What is Jitter ? Explain various types of jitters.   [6]

Or

2. (*a*) What is the significance of Q measurement. Explain the working of Q meter with neat block diagram.   [6]

(*b*) Describe Ramp Wave generator using IC 555.   [6]

3. (*a*) Define and explain the following specifications of ADC. [6]

Resolution, Accuracy, Monotonacity and DNL

P.T.O.

(*b*)   Output of three analog sensors are to be multiplexed. Let the output be 2V DC, Sine wave and a Traingular wave. How these channels can be selected using address lines in IC CD 4051. Explain with the help of logic table.   [6]

4. (*a*)   With a neat circuit diagram, explain the working of 4-bit binary weighted type DAC.   [6]

(*b*)   What is PLL ? Define and explain the terms Center frequency. Lock Range and Capture range for IC 565.   [6]

5. (*a*)   Describe the concept of Frequency Division Multiplexing with the help of a block diagram.   [6]

(*b*)   What is ASK and FSK ? Represent the following binary data in ASK and FSK format.   [7]

1 0 1 0 1 1 0 0

Or

6. (*a*)   What is Virtual Instrumentation ? Describe any *one* application of it in detail.   [6]

(*b*)   Compare FDM and TDM by their block diagram and other aspects.   [7]

7. (*a*)   What is Wave Analyser ? Draw and explain the block diagram of frequency selective analyser.   [7]

(*b*)   Write a short note on Logic Analyser.   [6]

Or

8. (*a*)   What is THD ? Describe Distortion Analyser in detail. [7]

(*b*)   Explain the working of FFT Analyser with the help of a block diagram.   [6]

Seat
No.

[5152]-559

S.E. (Instru. & Control) (Second Semester)

EXAMINATION, 2017

INDUSTRIAL DRIVES

(2015 PATTERN)

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

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

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

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

1.　(*a*)　With a neat diagram, explain the triggering arrangement of series and parallel connected SCRs.　　　[6]

　　(*b*)　With neat diagram and waveforms, explain the working of single half wave controlled rectifier with resistive load.　　　[6]

Or

2.　(*a*)　With neat diagrams, explain Symmetric and Asymmetric IGBT.　　　[6]

　　(*b*)　Write a short note on PWM inverters.　　　[6]

3.　(*a*)　With a neat diagram, explain the construction and working of permanent magnet stepper motor.　　　[6]

　　(*b*)　With a neat diagram, explain the motoring action in shaded pole motors.　　　[6]

Or

4. (*a*) Compare the DC series motor and shunt motor with respect to its schematic, characteristics and applications. [6]

(*b*) Write a short note on Universal motors. [6]

5. (*a*) With neat diagram, explain the chopper drive for DC motor. [7]

(*b*) Explain the halp step and full step method of stepper motor drive. [6]

Or

6. (*a*) With neat diagram, explain H bridge drive for motors. [7]

(*b*) Explain any *two* methods of speed and direction control DC motor. [6]

7. (*a*) Explain the closed loop control of induction motor. [7]

(*b*) Write a short note on variable frequency drive. [6]

Or

8. (*a*) With neat diagrams, explain firing angle control method for AC motors. [7]

(*b*) Write a short note on Solid state relay. [6]

Seat
No.

[5152]-562

S.E. (Computer Engineering) (I Sem.) EXAMINATION, 2017
DIGITAL ELECTRONICS AND LOGIC DESIGN
(2015 PATTERN)

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

N.B. :— (*i*) Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**,

Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*)   Neat diagram must be drawn wherever necessary.

(*iii*) Assume suitable data if necessary.

1.   (*a*)   Implement the expression using a 8 : 1 multiplexer   [4]

$f(a, b, c, d) = \Sigma m(0, 2, 3, 6, 8, 9, 12, 14)$.

(*b*)   What is the difference between combinational and sequential

circuits ?   [2]

(*c*)   Simplify the following logic function using the Quine-McCluskey

minimization technique :   [6]

$Y(A, B, C, D) = \Sigma m(0, 1, 3, 7, 8, 9, 11, 15)$.

Or

2.   (*a*)   Explain in detail look ahead carry generator   [6]

(*b*)   Design Mod-24 counter using 7490   [2]

(*c*)   Design a sequence detector using MS J-K flip-flop sequence

is 1101.   [4]

3. (*a*) Draw ASM chart for 2-bit UP counter using multiplexer controller method. [8]

(*b*) List any *two* medeling style of VHDL [2]

(*c*) Compare concurrent and sequential statement in VHDL [2]

Or

4. (*a*) Design 4 input and 6 output combinational circuit using PLA. The input variables are A, B, C and D : [6]

$$Y1 = \Sigma m(0, 3, 5, 6, 9, 10, 12, 15)$$
$$Y2 = \Sigma m(0, 1, 2, 3, 11, 12, 14, 15)$$
$$Y3 = \Sigma m(0, 4, 8, 12)$$
$$Y4 = \Sigma m(0, 2, 3, 5, 7, 8, 12, 13)$$
$$Y5 = \Sigma m(0, 1, 3, 4, 5, 6, 11, 13, 14, 15)$$
$$Y5 = \Sigma m(1, 2, 6, 8, 15).$$

(*b*) Draw block diagram of PLA device and explain. [6]

5. (*a*) Explain characteristics of digital ICs (any *four*). [4]

(*b*) Explain operation of TTL NAND gate. [6]

(*c*) Explain TTL open collector [3]

Or

6. (*a*) What is addressing mode ? Identify and justify addressing modes of the following 8051 instructions : [6]

(*i*) MOVX A, @DPTR

(*ii*) MOVC A, @ A+PC

(*iii*) ADD A, #10

(*iv*) MOV DPTR, #2550.

(*b*) What is microcontroller ? Distinguish between microcontroller and microprocessor. [7]

7. (*a*) Explain CMOS inverter. [4]

(*b*) Why wired logic is not possible in CMOS operation. [4]

(*c*) Explain tristate logic. [5]

Or

8. (*a*) Explain the physical structure and significances of all I/O ports of 8051 microcontroller. [7]

(*b*) Give significance of the following pins in 8051 : [6]

(*i*) PSEN#

(*ii*) EA#/VPP

(*iii*) ALE

(*iv*) TxD

(*v*) INT0#

(*vi*) RST.

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

Seat
No.

[5152]-563

S.E. (Comp.) (First Semester) EXAMINATION, 2017
DATA STRUCTURES AND ALGORITHNS
(2015 PATTERN)

Time : Two Hours   Maximum Marks : 50

1.   (*a*)   Show that $f(x) = 0\ (x^3)$ if function $f(x)$ is defined as
$f(x) = 5x^3 + 6x^2 + 1$ [3]

(*b*)   Differentiate between linear and non-linear data structure with example.   [3]

(*c*)   Explain divide and conquer strategy with example. Also comment on the time analysis.   [6]

Or

2.   (*a*)   Explain fast Transpose of sparse matrix with suitable example. Discuss time complexity of fast transpose.   [6]

(*b*)   Explain polynomial representation using arrays with suitable example.   [3]

(*c*)   Derive recurrence relation to represent set of natural numbers giving remainder one when digvided by three.   [3]

3.   (*a*)   Represent the following polynomial by using-generalized linked list :   [3]
(*a, b* (*c, d* (*e, g,*), *h*) (*f*))

(*b*)   Write an algorithm for postfix evaluation with suitable example.   [6]

(*c*)   Write a pseudo C code to reverse singly linked list.   [3]

4. (*a*) Convert the following prefix expression into postfix. * + *a* – *bc* / – *de* + – *fgh* [3]

(*b*) Write an algorithm to convert infix expression to postfix expression. [6]

(*c*) Write an algorithm to delete intermediate node from Doubly linked list. [3]

5. (*a*) What is circular queue ? Explain the advantages of circular queue over linear queue. [6]

(*b*) Write pseudo C/C++ code to represent queue as an ADT. [7]

Or

6. (*a*) Explain array implementation of priority queue with all basic operations. [6]

(*b*) Write pseudo C/C++ code to implement circular queue using linked list. [7]

7. (*a*) Explain quick sort and sort the given list using quick sort : 39, 09, 81, 45, 90, 27, 72, 18 [6]

(*b*) Write an algorithm for binary search. Derive recurrence relation and find out time complexity of the search. [7]

Or

8. (*a*) Explain heap sort and sort the given list using heap sort : 08, 03, 02, 11, 05, 14, 00, 02, 09, 04, 20. [6]

(*b*) Write a short note an stability of sorting. Compare bubble sort, insertion sort and selection sort with *one* example and discuss time complexity. [7]

Seat No.	

[5152]-564

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

COMPUTER ORGANIZATION AND ARCHITECTURE

(2015 PATTERN)

Time : Two Hours　　　　　　　　　Maximum Marks : 50

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

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

　　　　(*iii*)　Use of calculator is allowed.

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

1.　(*a*)　Multiply the following using Booth' algorithm　　[6]

　　　　Multiplicand = +11

　　　　Multiplier = –6.

　　(*b*)　Explain in brief seven RAID levels.　　　　[6]

Or

2.　(*a*)　Show the general structure of IAS Computer and explain. [6]

　　(*b*)　Draw and explain the flowchart of restoring division algorithm.　　　　　　　　　　　[6]

3. (*a*) What is the use of DMA ? Explain cycle stealing in DMA. [6]

(*b*) Explain the following addressing modes with one example each : [6]

(*i*) Immediate

(*ii*) Register Indirect

(*iii*) Direct Addressing

Or

4. (*a*) Differentiate between programmed I/O and interrupt driven I/O. [6]

(*b*) What is machine instruction ? Explain types of instructions. [6]

5. (*a*) What are various hazards in instruction pipelining ? Explain. [7]

(*b*) Write a short note on superscalar execution and superscalar implementation. [6]

Or

6. (*a*) Explain the instruction cycle in detail. [6]

(*b*) List and explain various ways in which an instruction pipeline can deal with conditional branch instructions. [7]

7. (*a*) Compare horizontal and vertical microinstruction format. [6]

(*b*) Explain in detail microinstruction sequencing organization. [7]

Or

8. (*a*) Compare Hardwired control over micro-programmed control. [6]

(*b*) Write a control sequence for the following instruction for single bus organization : ADD (R3), R1. [7]

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

Seat
No.

[5152]-565

S.E. (Computer) (First Semester) EXAMINATION, 2017
OBJECT ORIENTED PROGRAMMING
(2015 PATTERN)

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

N.B. :— (i) Answer Question **1** or **2**, **3** or **4**, **5** or **6** and **7** or **8**.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Assume suitable data, if necessary.

SECTION I

1. (a) Explain friend function with example. [4]

(b) Consider the following declaration :

class TRAIN

{

int trainno;

char dest[20];

float distance;

public:

void get( ); //To read an object from the keyboard

void put( ); //To write an object into a file

void show( ); //To display the file contents on the monitor

};

Complete the member functions definitions [8]

P.T.O.

2. (*a*) List the features of Object-oriented programming. [3]

(*b*) What is Pointer, Smart Pointer and Shared Pointer. Explain using diagram and program [9]

3. (*a*) What is exceptional handling ? [3]

(*b*) Explain :

(*i*) Virtual base class

(*ii*) Abstract Class [4]

(*c*) What is generic programming ? How is it implemented in C++ ?

[5]

Or

4. (*a*) Explain class template using multiple parameters. Write a program in C++. [8]

(*b*) Explain the significance of Static keyword in programming

[4]

5. (a) Write the C++ file input and output program using seekg( ), tellg( ), read( ) etc member functions. [7]

(*b*) What are cin and cout ? Explain iostream. [6]

Or

6. (*a*) What are various functions which are used to manipulate file pointers ? Explain using examples. [7]

(*b*) Explain command line arguments in C++. Write program to explain the same. [6]

7. (*a*) Use minimum 8 functions of vector STL. Write a program to explain the same. [7]

(*b*) What is STL ? List different types of STL containers. [6]

Or

8. (*a*) Write a program to implement Map using STL [6]

(*b*) What is container ? List the container classes in C++. Explain any *one* of them using program [7]

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

Seat
No.

[5152]-568

S.E. (Computer) (Second Semester) EXAMINATION, 2017
ADVANCED DATA STRUCTURES
(2015 PATTERN)

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

N.B. :— (i) Answer *four* questions in all.

(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 a non-recursive pseudo for post order traversal of binary tree. [5]

(B) Consider the given graph and find the shortest path by using Dijkstra's algorithm from 'a' to 'g'. [7]
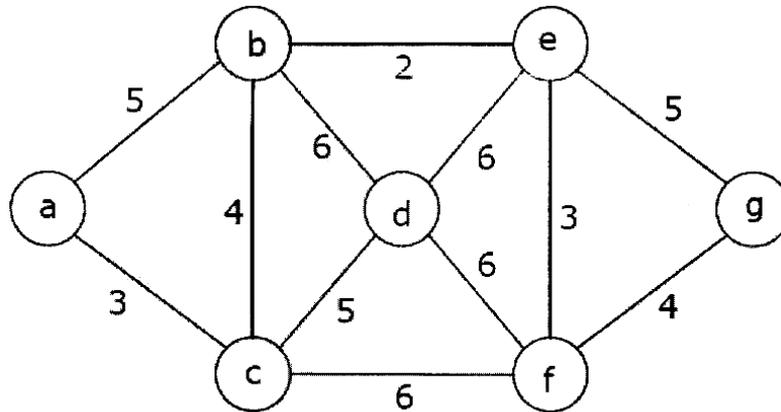
Or

2. (A) Construct a binary tree from given *two* traversals : [6]

Inorder Traversal—1 2 3 14 7 10 11 40 30

Postorder Traversal–1 3 2 7 10 40 30 11 14

(B) Write a short note on topological sorting. [6]

3. (A) Write short note on skip list. [6]

(B) Build the AVL tree for the following data. Show the step by step construction 25, 12, 17, 30, 15, 14, 37, 27, 40, 29, 28 [6]

Or

4. (A) Write functions for LL and LR rotation with respect to AVL tree. [6]

(B) Construct hash table of size 10 using linear probing with replacement strategy for collision resolution. The hash function is $h(x) = x\% 10$. Calculate total numbers of comparisons required for searching. Consider slot per bucket is 1

25, 3, 21, 13, 1, 2, 7, 12, 4, 8 [6]

5. (A) Construct a B tree of order 3 for the following data : [7]

50, 30, 21, 90, 10, 13, 20, 70, 25, 92, 80

(B) What is max heap ? Write a function to insert an element in max heap. What is the time complexity of inserting an element in Max heap ? [7]

Or

6. (A) Write an algorithm to delete a node from B-tree. [7]

(B) Create min heap of given data 10, 20, 15, 12, 25, 30, 14, 2, 5, 4. After creation of min heap perform one delete operation on it and show the final min heap. [7]

7. (A) Explain sequential file, Random access file organization. [6]

(B) Explain linked organization with respect to file handling.[6]

Or

8. (A) Explain any *three* operations on sequential file organization with example. [6]

(B) Write a short note on external sort. [6]

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

Seat
No.

[5152]-570

S.E. (Computer Engg.) (Second Semester)
EXAMINATION, 2017
PRINCIPLES OF PROGRAMMING LANGUAGES
(2015 PATTERN)

Time : Two Hours   Maximum Marks : 50

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

(ii) Figures to the right indicate full marks.

1. (a) Define the syntax and semantics. Compare and contrast the axiomatic semantics and denotational semantics. [6]

(b) List and discuss the Statement-level control structures and Unit-level control structures with their syntax. [7]

Or

2. (a) Explain how following concepts are used in design of data types with examples : [6]

(i) Data Aggregates and type constructors

(ii) Cartesian Prodct

(iii) Sequencing.

(b) What is importance of reliability and maintainability to programming languages ? List the factors which ensure the reliability and maintainability. [7]

P.T.O.

3. (*a*) What are *four* main programming paradigms ? Which programming languages are based on these ? Explain the features of any *one* of these. [6]

(*b*) Write a program which receives *n* integers. Store the integers in an array. Program outputs the number of odd and even numbers present this array. [6]

Or

4. (*a*) What are primitive data types ? List the primitive data types in Java and their respective storage capacity. [6]

(*b*) Explain various methods of grouping programming units in Ada. What is advantage of grouping the units ? [6]

5. (*a*) What is an Interface in Java ? How is this different than a class ? Give example of interface. [6]

(*b*) What do you mean by method overloading ? Write a program which adds *two* integers and *three* integers by using overloaded methods for adding *two* and *three* integers respectively. [7]

Or

6. (*a*) What is the use of static variables and methods in Java ? Give example of static declaration. What are restrictions on methods which are declared static ? [7]

(*b*) What is method overriding in Java ? What is advantage of using overriding ? Demonstrate method overriding with example. [6]

7. (*a*) How is the architecture of an applet different than a console based program ? Explain the function of init( ), start( ) and stop( ) methods. [6]

(*b*) Which class supports character input to the program ? Write a program to read the name of the user and display welcome message. [6]

Or

8. (*a*) What is the use of PrintStream and PrintWriter classes ? Which methods are suppoted by these classes ? Give example of each. [6]

(*b*) What are uncaught exceptions ? What are advantages of exception handling ? State the use of try( ), catch( ) and throw( ) methods. [6]

Total No. of Questions—8]   [Total No. of Printed Pages—6

Seat
No.

[5152]-571

S.E. (Information Technology) (I Sem.) EXAMINATION, 2017

DISCRETE STRUCTURE

(2015 PATTERN)

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

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

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

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

     (*iv*)   Use of calculator is allowed.

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

1.   (A)   Out of a total of 130 students, 60 are wearing hats, 51 are
                wearing scarves, and 30 are wearing both hats and scarves.
                Out of 54 students who are wearing sweaters, 26 are wearing
                hats, 21 are wearing scarves, and l2 are wearing both hats
                and scarves. Everyone wearing neither a hat nor a scarf is
                wearing gloves :

         (*a*)   How many students are wearing gloves ?

                                                          P.T.O.

(*b*)   How many students not wearing a sweater are wearing hats but not scarves ?

(*c*)   How many students not wearing a sweater are wearing neither hat nor a scarf ?   [6]

(B)   Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5 ? [3]

(C)   In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green ?   [3]

Or

2.   (A)   Prove by induction that the sum of the cubes of three consecutive integers is divisible by 9.   [6]

(B)   Two cards are drawn together from a pack of 52 cards. Determine the probability that one is a spade and one is a heart.   [4]

(C)   Three unbiased coins are tossed. What is the probability of getting at most two heads ?   [2]

3. (A) Solve the following recurrence relation : [6]

$$a_r - 7a_{r-1} + 10a_{r-2} = 2^r$$

$$a_1 = 3, \ a_2 = 21.$$

(B) Find the shortest path from vertex a to z in the following graph : [6]
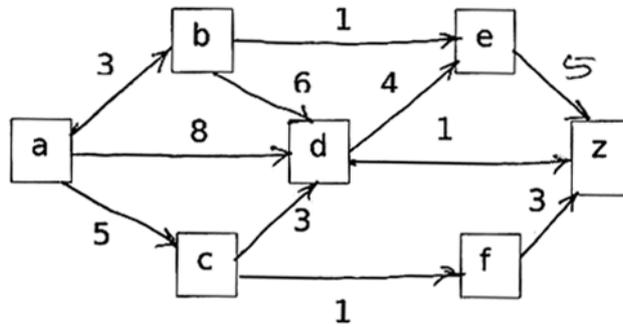
Or

4. (A) Functions f, g and h are defined on the set X = {1, 2, 3} as : [6]

$$f = \{(1, \ 3), \ (2, \ 1), \ (3, \ 2)\};$$

$$g = \{(1, \ 2), \ (2, \ 3), \ (3, \ 1)\};$$

$$h = \{(1, \ 2), \ (2, \ 1), \ (3, \ 3)\}$$

(*i*) Find fog and gof. Are the equals ?

(*ii*) Find fogoh and fohog.

(B)   Define Isomorphic Graphs. Show that the following graphs G1
       and G2 are isomorphic.   [6]

G1   G2
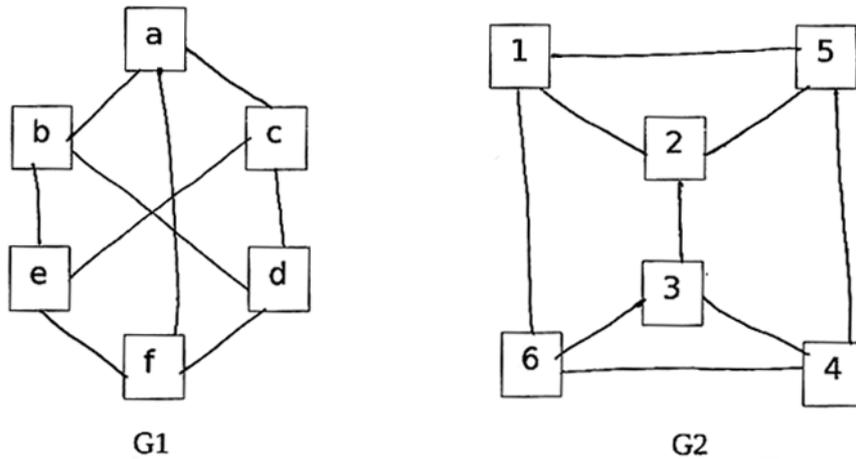
5.   (A)   Find the minimum spanning tree and weight of it for the
             given graph using Kruskal's algorithm.   [7]
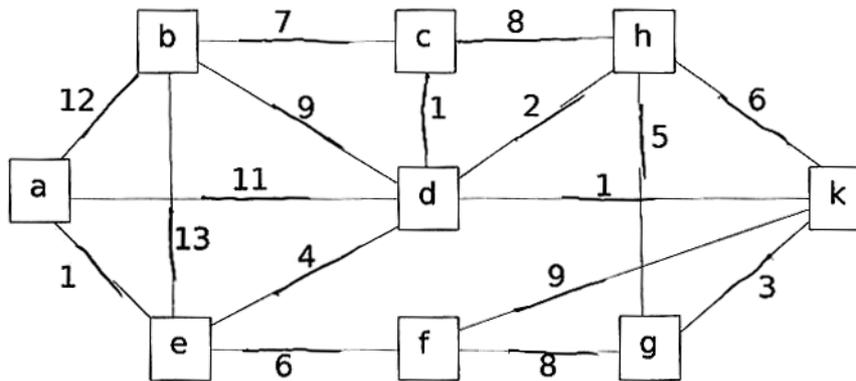
(B)   Define optimal tree. For the following set of weights, construct
       optimal binary prefix code. For each weight in the set, give
       corresponding prefix code :   [6]

                   1, 4, 8, 9, 15, 25, 31, 37.

Or

6. **(A)** Find the maximum flow for the following transport network. [7]
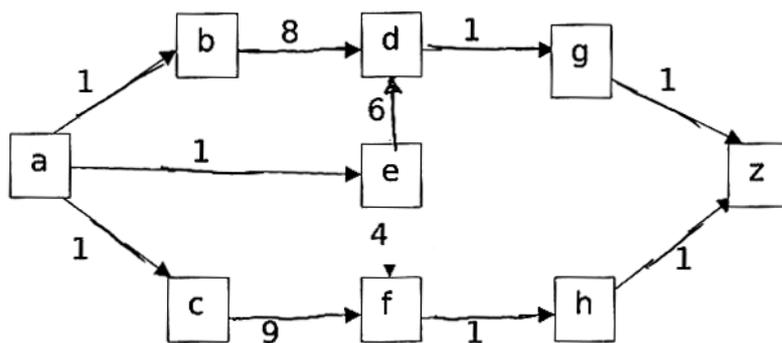
(B) Find the fundamental system of cut set for the graph G shown below with respect to the spanning tree T. [6]

G   T
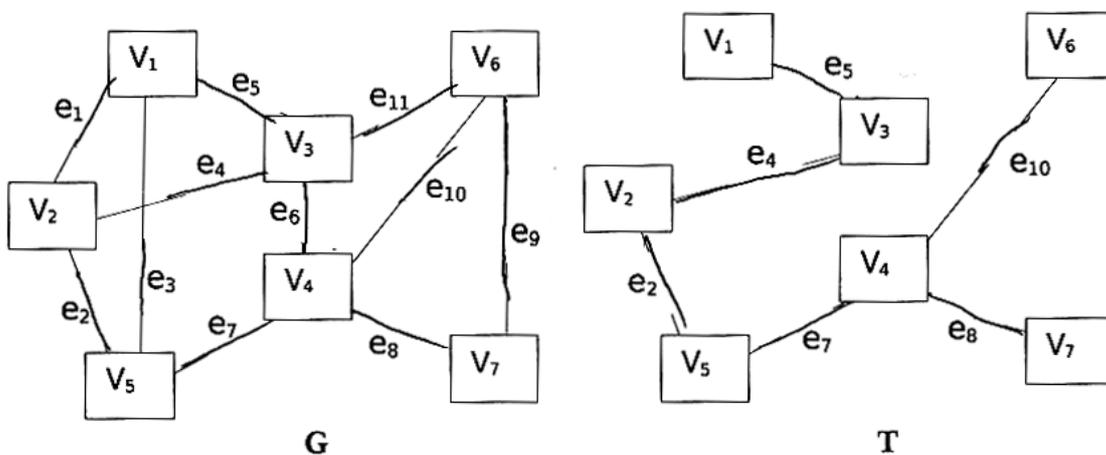
7. **(A)** Let Q_1 be the set of all rational numbers other than 1. Show that with operation * defined on the set Q_1 by $(a * b = a + b - ab)$ is an Abelian group. [7]

(B) Let I be the set of all integers. For each of the following determine whether * is an associative operation or not : [6]

(1) a * b = max(a, b)

(2) a * b = min(x + 2, b)

(3) a * b = a − 2b

(4) a * b = max(2a − b, 2b − a).

Or

8. (A) Let Z_n be the set of integers {0, 1, 2, ..., n − 1}. Let ⊕ be a binary operation on Z_n such that :

$$a \oplus b = \begin{cases} a + b\, if\, a + b < n \\ a + b − n\, if\, a + b \geq n \end{cases}$$

Let ⊙ be a binary operation on Z_n such that :

a ⊙ b = the remainder of ab divided by n.

Show that $(Z_n, ⊕, ⊙)$ is Ring. [7]

(B) Consider the (2, 7) encoding function e. [6]

$e(00)$ = 0000000 $e(01)$ = 1010101

$e(10)$ = 0111110 $e(11)$ = 0110110

(a) Find the minimum distance of e.

(b) How many errors will e detect ?

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

Seat
No.

[5152]-572

S.E. (Information Technology) (I Sem.) EXAMINATION, 2017
COMPUTER ORGANIZATION AND ARCHITECTURE
(2015 PATTERN)

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

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

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

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

1.   (*a*)   Multiply 101011 by 110011 using Booth's algorithm   [6]

(*b*)   List different addressing modes and explain any *two* with suitable diagrams and example.   [6]

Or

2.   (*a*)   Draw diagram of instruction cycle states of a processor and explain.   [6]

(*b*)   Perform the division using non-restoring method 22/3.   [6]

3.   (*a*)   Draw diagram of single bus processor organization and explain.   [7]

(*b*)   Explain any *one* type of cache mapping technique with diagram. [6]

Or

4.   (*a*)   Explain micro programmed control unit along with block diagram.   [7]

(*b*)   How virtual memory is managed using paging and TLB ? [6]

P.T.O.

5. (*a*) What are the hazards in pipeline architecture ? Explain its types. [6]

(*b*) Explain events of Execute cycle of MIPS pipeline. [6]

Or

6. (*a*) Explain events of Fetch cycle of MIPS pipeline. [6]

(*b*) Which are the different stages in 5 stage pipeline ? [6]

7. (*a*) What is cluster computing ? What are the types of clustering ? [6]

(*b*) Write a note on multicore architecture. [7]

Or

8. (*a*) Explain closely coupled and loosely coupled microprocessor system. [7]

(*b*) What is Flynn's taxonomy for multiple processor organizations ? Explain with diagram. [6]

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

Seat
No.

[5152]-573

S.E. (Information Technology) (First Semester)
EXAMINATION, 2017
DIGITAL ELECTRONICS AND LOGIC DESIGN
(2015 Course)

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

N.B. :— (*i*) Answer Question **1** *or* **2, 3** *or* **4, 5** *or* **6** and **7** *or* **8**.

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

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

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

1. (*a*) Explain any *three* characteristics of Digital ICs.   [6]

(*b*) Implement the following Boolean function using single 8:1 multiplexer :   [6]

$F(A, B, C, D) = \Sigma m(1, 4, 6, 9, 13)$

Or

2. (*a*) Do the following   [6]

(*i*) $(7F)_{16} - (5C)_{16}$ using 2's complement method

(*ii*) $(735.25)_{10} = (?)_{16}$

(*iii*) $(101011.111011)_2 = (?)_8 (?)_{16}$

(*b*) Simplify the following Boolean function using Quine MC-Clusky Technique $F (A, B, C, D) = \Sigma(0, 1, 3, 7, 8, 9, 11, 15)$. [6]

3. (*a*) Design and draw logic diagram of mod 45 counter using IC 7490   [6]

(*b*) Design sequence generator to generate the sequence 1011 using shift register IC 74194.   [6]

P.T.O.

4. (*a*) Explain with a neat diagram Ring Counter. [6]

(*b*) Design flip-flop conversion logic to convert JK flip-flop to T flip-flop. [6]

5. (*a*) Draw the ASM chart for 2-bit binary Up/ Down counter with control input M such that if M=0 counter counts in Up direction and if M=1 Counter counts in Down Direction.

Design the same using MUX Controller Method using D flip-flops. [7]

(*b*) Explain architecture of CPLD with the help of suitable diagram. [6]

Or

6. (*a*) Design Full Adder using PLA [7]

(*b*) Compare CPLD and FPGA [6]

7. (*a*) Explain VHDL modeling styles with example. [7]

(*b*) Write VHDL program for 3:8 decoder. [6]

Or

8. (*a*) What is VHDL ? Write features of VHDL. Explain the structure of VHDL module. Define entity and architecture for 2 input OR gate. [7]

(*b*) Explain the difference between concurrent and sequential statements with an example. [6]

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

Seat
No.

[5152]-575

S.E. (Information Technology) (First Semester)
EXAMINATION, 2017
PROBLEM SOLVING AND OBJECT ORIENTED
PROGRAMMING CONCEPTS
(2015 PATTERN)

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

N.B. :— (*i*) Answer Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**,

Q. No. **5** or Q. No. **6**, Q. No. **7** or Q. No. **8**.

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

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

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

1. (*a*) What are different types of operators ? Give hierarchy/
precedence of operators.   [6]

(*b*) Explain the concept of local variable and global variable with
suitable example.   [6]

Or

2. (*a*) What are the six steps of problem solving ?   [6]

(*b*) Explain "Top-down design" to solve the problem.   [6]

3. (*a*) Write an algorithm for finding maximum element of an
array.   [4]

(*b*) Define the terms polymorphism, data abstraction.   [4]

(*c*) Explain various features of Object Oriented Programming. [4]

P.T.O.

Or

4. (*a*) Define Constructors and Destructors.   [4]

(*b*) Define a Class Bank Account having data members and member functions as :   [4]

Data members :

(1) Name of depositor

(2) Account number

(3) Type of account

(4) Balance amount in the account.

Member functions :

(1) To assign initial values

(2) To deposit an amount

(3) To withdraw an amount after checking the balance

(4) To display name and balance.

(*c*) What is need of virtual destructor ?   [4]

5. (*a*) What is inheritance ? What are different types of inheritance ? [6]

(*b*) Write a C++ program to demonstrate multiple inheritance. [4]

(*c*) What are rules of operator overloading ?   [3]

Or

6. (*a*) Write a C++ program to add the complex numbers using binary operator overloading.   [6]

(*b*) Explain early binding and late binding.   [4]

(*c*) Explain virtual base class with example.   [3]

7. (*a*) Explain Standard Template Library (STL).   [6]

(*b*) What is generic programming ? How is it implemented in C++ ?   [4]

(*c*) Define friend class. Explain the concept of forward declaration of class. [3]

Or

8. (*a*) Describe briefly the features of I/O system supported by C++. [6]

(*b*) What is formatted and unformatted I/O operations. [4]

(*c*) Explain how the exception is handled in C++. [3]

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

Seat
No.   **[5152]-577**

S.E. (Information Technology) (Second Semester)

EXAMINATION, 2017

PROCESSOR ARCHITECTURE AND INTERFACING

(2015 PATTERN)

Time : Two Hours   Maximum Marks : 50

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

(ii)   Figures to the right indicate full marks.

(iii)   Assume suitable data, if necessary

1.   (a)   Explain significance of Assembler, Linker, Debugger and
Emulator.   [7]

(b)   Explain significance of call gates with its format.   [5]

Or

2.   (a)   Explain significance of GDT, LDT and IDT. in 80386 with
diagram.   [7]

(b)   Explain difference between Macro and Procedure.   [5]

3.   (a)   Explain internal memory structure of 8051.   [5]

(b)   Draw diagram of Non-pipelined read cycle of 80586 and
explain.   [7]

Or

4. (*a*) List features of 8051 Microcontroller. Compare Microcontroller with Microprocessor. [5]

(*b*) What is Multitasking ? Explain with diagram. [7]

5. (*a*) Explain significance of various ports [P_0 to P_3] in 8051. [7]

(*b*) Explain significance to TCON and TMOD with format. [6]

Or

6. (*a*) Explain interrupt structure of 8051 with diagram. [7]

(*b*) Explain Mode 0 and Mode 1 of timer in 8051. [6]

7. (*a*) How to configure port 1 and port 2 for 2-digit seven segment display ? Explain with diagram and instruction. [7]

(*b*) Draw interfacing diagram of DAC with 8051. Explain. [6]

Or

8. (*a*) Draw interfacing diagram of 8051 with external program memory as 4k × 8 and external data memory as 2k × 8.[7]

(*b*) Draw and explain functional block diagram of 8255. [6]

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

Seat
No.

[5152]-578

S.E. (I.T.) (Second Semester) EXAMINATION, 2017

DATA STRUCTURES AND FILES

(2015 PATTERN)

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

N.B. :— (*i*) Answer *four* questions.

   (*ii*) Neat diagrams must be drawn wherver necessary.

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

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

1.   (*a*) Clearly indicate the content of stack for evaluating the following
           postfix expression.   [6]

           Assume A = 10, B = 2, C = 13 :

           (*i*)   AB + C − BA − C + −

           (*ii*)   ABC + *CBA − + *

     (*b*) Construct a binary tree from the given traversals :   [6]

           postorder : HIDEBFGCA

           inorder   : HDIBEAFCG.

Or

2.   (*a*) Explain the concept of Multiqueue and double ended queue
           with example.   [6]

     (*b*) Write a pseudo code for kruskals algorithm.   [6]

P.T.O.

3. (*a*) What are the characteristics of good hash function ? List out different techniques to resolve collision in hash table. Explain Linear probing with and without replacement with suitable example. [8]

(*b*) Define binary search tree. Draw the BST for given nodes : [4]

38, 14, 56, 23, 82, 8, 45, 70, 18, 15.

Or

4. (*a*) For the following graph find the DFS and BFS using suitable data structure. [4]
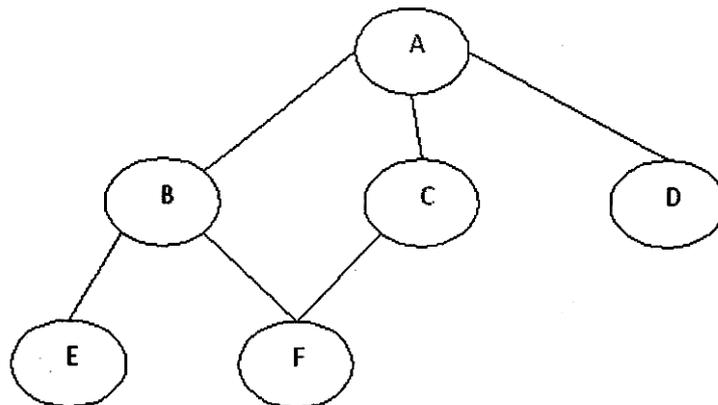
(*b*) Sort the following number using heap sort and show the sorting stepwise : 44, 66, 33, 88, 77, 55, 22. [8]

5. (*a*) What is threaded binary tree explain with example. [6]

(*b*) What is B-tree ? Explain the following operation on B-tree : [8]

(*i*) Inserting into B-tree

(*ii*) Deletion from B-tree.

Or

6. (*a*) Obtain an AVL tree by inserting one data element at a time in the following sequence : [8]

50, 55, 60, 15, 10, 40, 20, 45, 30, 70, 80.

Label the rotations appropriately at each stage.

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

(*i*) Red black tress

(*ii*) Splay tress.

7. (*a*) Explain various file opening modes with respect to text and binary files. [6]

(*b*) What are the primitive operations on sequential file ? Explain with example. [6]

8. (*a*) Compare the feature of sequential file, index sequential file and direct access file. [6]

(*b*) Write C++ program to perform the following operations on direct access file : [6]

(*i*) Create & display records

(*ii*) Insert record.

Seat
No.

[5152]-579

S.E. (I.T.) (II Sem.) EXAMINATION, 2017

FOUNDATIONS OF COMMUNICATION & COMPUTER NETWORK

(2015 PATTERN)

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

N.B. :— (*i*) Answer Question Nos. **1** *or* **2**, **3** *or* **4**, **5** *or* **6**, **7** *or* **8**.

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

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

1. (*a*) Explain with examples different addressing schemes used in TCP/IP. [6]

(*b*) Draw a neat waveform for amplitude modulation : [6]

(*i*) Modulating signal

(*ii*) Carrier signal

(*iii*) Amplitude modulated signal.

Or

2. (*a*) Calculate the maximum bit rate of Channel having bandwidth 1200 Hz if : [6]

(*i*) S/N ratio is 0 dB

(*ii*) S/N ratio is 20 dB.

(*b*) Explain the difference between Phase modulation and frequency modulation. [6]

3. (*a*) Explain the following shift keying Techniques with suitable examples : [7]

   (*i*) ASK

   (*ii*) FSK

   (*iii*) PSK.

   (*b*) What is CRC ? Generate the CRC code for message 1101010101. Given generator Polynomial $g(x) = x^4 + x^2 + 1$. [6]

Or

4. (*a*) Draw and explain PCM and DM. [7]

   (*b*) Explain in detail Go-Back-N and Selective Repeat ARQ System. [6]

5. (*a*) Explain CSMA and CSMA/CD. Also comment on the efficiency of each. [6]

   (*b*) Explain FDMA, TDMA and CDMA in detail. [6]

Or

6. (*a*) Explain FDM and statistical TDM. [6]

   (*b*) Discuss CSMA/CA random access technique. How collision avoidance is achieved in this technique ? [6]

7. (*a*) Discuss Fast Ethernet technology in brief. State its specification. [6]

(*b*) Compare and contrast circuit switched network with packet switched network. [7]

Or

8. (*a*) Explain circuit switched network with three phases. [6]

(*b*) Explain the frame format for IEEE 802.3. [7]

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

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[5152]-581

S.E. (Chemical) (First Semester) EXAMINATION, 2017
CHEMISTRY–I
(2015 PATTERN)

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

N.B. :— (*i*)   Answer *four* questions.

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

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

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

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

1.   (*a*)   Explain the relative stability of $1°$, $2°$ and $3°$ free radicals.

[4]

(*b*)   Draw and describe molecular diagram and find the bond order for Nitrogen molecule.   [4]

(*c*)   Quantum efficiency of photochemical reaction between H_2 and Cl_2 is 10^5, with wavelength of 4800 Å. Calculate the number of moles of HCl formed from 1 joule of the energy.   [4]

Or

2.   (*a*)   Derive the integrated rate expression for second order kinetics involving two reactants with same initial concentration. [4]

(*b*)   Explain activated complex theory.   [4]

(c) Draw resonance structures of nitrobenzene and aniline. [4]

3. (a) Explain the principles of UV spectroscopy. [4]

   (b) Explain any *two* detectors in gas chromatography. [4]

   (c) Give the experiment and equation for molar mass of solute in lowering of vapour pressure of solvent. [4]

Or

4. (a) Derive the equation for molar mass of solute by elevation in boiling point. [4]

   (b) Define Van't Hoff factor. How is it calculated for disassociation of solute. [4]

   (c) Explain the effect of Hydrogen bonding on IR absorption.

[4]

5. (a) Give the mechanism of acylation of benzene. [4]

   (b) Write a short note on Claisen rearrangement. [4]

   (c) What are the effects of the following factors on S_N1 and S_N2 reactions : [5]

   (i) Nature of Nucleophile

   (ii) Nature of solvent

Or

6. (a) Why toluene undergoes nitration faster than benzene. [4]

   (b) Give the mechanism of Beckmann's rearrangement. [4]

   (c) Discuss the machanism of E_1 and E_2 reactions. [5]

7. (a) Give *two* methods of synthesis of pyrrole and furan. [4]

(b) Explain why electrophilic substitution, reaction takes place at position 'three' is pyridine. [4]

(c) Give classification of dyes on basis of application. [5]

Or

8. *(a)* Describe scraup synthesis for quinoline. [4]

(b) Give the steps involved in the preparation of Alizarin. [4]

(c) Explain briefly colour and constitution of a dye. [5]

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

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No.

[5152]-583

S.E. (Chemical) (First Semester) EXAMINATION, 2017

ENGINEERING MATERIALS

(2015 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*)　Define the following terms :　　　　　　　　　[6]

(*i*)　Shear Stress

(*ii*)　Factor of Safety

(*iii*)　Malleability

(*b*)　Draw and explain stress-strain curve for ductile materials.

[6]

Or

2. Write short notes on :　　　　　　　　　　　　[12]

(*i*)　Brinell Hardness Test

(*ii*)　Ultrasonic Inspection.

3. (*a*) Draw and explain Iron-Iron carbide equilibrium diagram. [6]

(*b*) Explain in brief the classification of Nanomaterials. [4]

(*c*) State applications of Nanomaterials. [3]

Or

4. (*a*) Explain Sol-Gel method for synthesis of Nanomaterials. [7]

(*b*) Write a short note on Carbon Nanotubes. [6]

5. Write short notes on : [13]

(*a*) Scanning Electron Microscope (SEM)

(*b*) X-ray diffraction

Or

6. Explain in detail principle and working of Transmission Electron Microscope (TEM). [13]

7. (*a*) Define Glass Materials. Write applications of glass materials.

[6]

(*b*) Write down the Mechanical and Electrical properties of ceramic materials. [6]

Or

8. Write short notes on : [12]

(*i*) Refractories

(*ii*) Glass vitreous silica

(*iii*) Borosilicate.

Total No. of Questions—8]

[Total No. of Printed Pages—4

Seat
No.

[5152]-584

S.E. (Chemical) (First Semester) EXAMINATION, 2017
PROCESS CALCULATIONS
(2015 PATTERN)

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

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

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

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

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

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

1. (*a*) The flow rate of water through a pipe is reported as 15 cubic feet per minute. Taking density of water as 1 g/cc, calculate the mass flow rate in kg/s.   [4]

(*b*) A gas mixture consisting of 65% N_2 and 35% SO_3 by volume is admitted to an absorption column at a rate of 4500 kg/h. It is contacted with a stream of 50% H_2SO_4 flowing counter current to the gas stream at a rate of 5000 kg/h. The gases leave at 101.3 kPa. Water lost with the exit gases exerts a partial pressure of 25 kPa. If the concentrated acid leaving the bottom of the column contained 75% H_2SO_4, what percent of the entering SO_3 is absorbed and converted to acid ?   [8]

2. (*a*) An aqueous of Acetic Acid of 30% concentration (by mass) has density 1040 kg/m^3. Find Molality, Normality and Molality of the solution. [5]

(*b*) After crystallization operation, the solution of $CaCl_2$ in water contains 60 g of $CaCl_2$ per 100 g of water. Calculate the amount of this solution necessary to dissolve 200 kg of $CaCl_2 \cdot 6H_2O$ crystals at a temperature of 298 K. The solubility of $CaCl_2$ at 298 K is 819.2 g of $CaCl_2 \cdot 6H_2O$ per 1000 g of water. [7]

3. (*a*) Hydrogen gas is burned in an adiabatic reactor with two times the theoretical quantity of air, both air and hydrogen being at 298 K initially. What will be the temperature of the reaction product ? The standard heat of formation of gaseous water is –241.826 kJ/mol. The heat capacities (kJ/mol K) of the gases are as follow : [8]

Water Vapor : $C_P = 30.475 + 9.652 \times 10^{-3} \, T + 1.189 \times 10^{-6} \, T^2$

Nitrogen : $C_P = 27.034 + 5.815 \times 10^{-3} \, T - 0.2889 \times 10^{-6} \, T^2$

Oxygen : $C_P = 25.611 + 13.260 \times 10^{-3} \, T - 4.2077 \times 10^{-6} \, T^2$

(*b*) Ethylene oxide is produced by oxidation of ethylene. 100 kmol of ethylene are fed to a reactor and the product is found to contain 80 kmol ethylene oxide and 10 kmol CO_2. Calculate the percentage conversion of ethylene and percentage yield of ethylene oxide. [5]

4. (*a*) Formaldehyde is produced by dehydrogenation of methanol :

$$CH_3OH \rightarrow HCHO + H_2$$
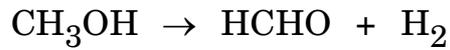
The per pass conversion is 67%. The product leaving the reactor is fed to separation unit battery where formaldehyde is separated from methanol and hydrogen. The separated methanol is recycled to reactor. If the production rate of formaldehyde is 1000 kg/h. Calculate :

(*i*)   cornbined feed ratio

(*ii*)   flow rate of methanol required to the process as fresh feed.   [7]

(*b*) Pure methane is heated from 30°C to 250°C at atmospheric pressure. Calculate heat added per kg of methane :

$C_P = 19.249 + (52.113 \times 10^{-3})T + (11.973 \times 10^{-6} \, T^2)$ kJ/kmol K.   [6]

5. (*a*) Carbon dioxide contains 0.053 kmol water vapour per kmol of dry CO_2. Temperature of the gas is 308 K and the pressure is 100 kPa. Calculate the relative saturation of the mixture. percentage saturation and the temperature upto which the mixture must be heated in order to achieve a relative saturation of 30%. Vapour pressure of water 308 K = 5.6 kPa and at 330 K = 16.475 kPa.   [8]

(*b*) Define Relative humidity, percentage humidity and Humid volume. Derive the relation between them.   [5]

6. A liquid mixture containing 30 mole % benzene (B), 25% toluene (T) and 45% xylene (X) is fed at the rate of 1000 kmol/h to a distillation unit consisting of two columns. The bottom product from the first column is to contain 99 mole % X and no B, and 98% of the X in the feed is to be recovered in this stream. The overhead from the first column is fed to the second column. The overhead from the second column contains 99 mole % B and no X. The benzene recovered in this stream represents 96% of the B in the feed to this column. Calculate the molar flow rates (kmol/h) and component mole fraction in each product stream from both columns. [13]

7. (*a*) Explain in detail about proximate analysis of coal. [5]

(*b*) The orsat analysis of the flue gases from a boiler house chimney gives CO_2 : 11.4%, O_2 : 4.2% and N_2 84.4% (mole %). Assuming that complete combustion has taken place. Calculate the % excess air, and also find the C/H ratio in the fuel. [7]

8. (*a*) Explain the following : [6]

(1) Classification of fuels

(2) Calorific values of fuels

(3) Adiabatic Flame Temperature.

(*b*) The gross heating value of gaseous *n*-butane is 2877.40 kJ/ mol at 298 K. Calculate its net heating value in kJ/mol and kJ/kg. [6]

[5152]-584   4

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

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No.</td><td></td></tr>
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[5152]-585

S.E. (Chemical) (First Semester) EXAMINATION, 2017
ENGINEERING MATHEMATICS–III
(2015 PATTERN)

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

N.B. :— (i) Solve Q. No. **1** or **2**, Q. No. **3** or **4**, Q. No. **5** or Q. No. **6**, Q. No. **7** or **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) $(D - 1)^2 \, y = e^x \sin x$

     (ii) $x^2 \dfrac{d^2 y}{dx^2} + x \dfrac{dy}{dx} - y = x^3$

     (iii) $\dfrac{d^2 y}{dx^2} + y = \tan x$ (by method of variation of parameters)

  (b) Find the Fourier cosine transform of $f(x) = e^{-x}$ [4]

Or

2. (a) A 2 kg weight suspended from a string stretches it 8 cm. The weight is pulled 15 cm below the equilibrium position and then released. Find the displacement of the body from its equilibrium position in time 't' seconds and period of oscillation. [4]

(b) Find the Fourier sine integral representation of

$$f(x) = \begin{cases} \dfrac{\pi}{2}, & 0 < x < \pi \\ 0, & x > \pi \end{cases}$$ [4]

(c) Solve the integral equation :

$$\int_0^\infty f(x) \cos \lambda x \, dx = e^{-\lambda}, \lambda > 0$$ [4]

3. (a) Attempt *any* one : [4]

(i) Find the Laplace transform of :

$$\int_0^t e^{-2t} . t. \sin 3t \, dt \, .$$

(ii) Find the inverse Laplace transform of :

$$\frac{s+1}{s^2 - 6s + 25} .$$

(b) Solve by Laplace transform method : [4]

$$\frac{d^2 y}{dt^2} - 4 \frac{dy}{dt} + 4y = 64 \sin 2t, \, y(0) = 0, \, y'(0) = 1 \, .$$

(c) Find the directional derivative of $Q = xy^2 + yz^3$ at (1, −1, 1) in the direction of the trangent to the curve $x = \sin t, \, y = \cos t, \quad z = t$ at $t = \pi/4$. [4]

Or

4. (a) Attempt any *one* : [4]

(i) Prove that : $\nabla . \left[{}^{r\nabla} \left(\dfrac{1}{r^4} \right) \right] = \dfrac{8}{r^5}$

(ii) $\nabla^2 \left[\nabla . \left(\dfrac{\bar{r}}{r^2} \right) \right] = \dfrac{2}{r^4}$

[5152]-585   2

(b) Show that vector field

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

is irrotational and also find the scalar function ϕ s.t. $\overline{F} = \nabla\phi$. [4]

(c) Find the Laplace transform of : [4]
$$t^2 \cup (t - 2) + e^{-4t} \; \delta \; (t - 3)$$

5. Solve any *two* :

(a) Verify Green's theorem for $\overline{F} = x\vec{i} + y^2\vec{j}$ over first quadrant of circle $x^2 + y^2 = a^2$. [6]

(b) Show that by divergence theorem $\displaystyle\iint_S \frac{\overline{a} \times \overline{r}}{r}. d\overline{S} = 0$ where S is closed surface. [6]

(c) Evaluate using Stokes' theorem $\displaystyle\iint_S \left(\nabla \times \overline{F}\right). d\overline{S}$ where $\overline{F} = y^3\vec{i}$ and S is surface $x^2 + y^2 = 4, \; z = 0$.

Or

6. Solve any *two* :

(a) Evaluate $\displaystyle\int_c \overline{F}. d\overline{r}$ where :

$$\overline{F} = \left(2xy + y^2\right)\vec{i} + \left(3y - 4x\right)\vec{j}$$

for a curve joining points $(0, 0)$ to $(1, 1)$.

(b) Evaluate $\displaystyle\iint_s \left(x\vec{i} + y\vec{j} + z^2\vec{k}\right). d\overline{S}$ over the surface of cylinder $x^2 + y^2 = 4$ cut by the plane $z = 0$ and $z = 5$.

(c) Evaluate using Stokes' theorem $\displaystyle\int_c \overline{F}. d\overline{r}$ where $\overline{F} = -y^3\vec{i} + x^3\vec{j}$, where closed curve C is boundary of ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1, \; z = 0.$ [7]

7. Solve any *two* :

(*a*) A tightly stretched string with fixed end points $x = 0$ and $x = l$ is initially in a position given by $y(x, 0) = 2\sin\left(\dfrac{\pi x}{l}\right)$

$+ 3\sin\left(\dfrac{2\pi x}{l}\right)$. If it is released from rest from this position, find the displacement y *dt* any distance x from one end and at any time t.

(*b*) Solve $\dfrac{\partial u}{\partial t} = \dfrac{\partial^2 u}{\partial x^2}$ if :

    (*i*) u is finite $\forall t$,

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

    (*iii*) $u = \pi x - x^2$ when $t = 0$, $0 \le x \le \pi$.

(*c*) An infinitely long uniform metal plate is enclosed between lines $y = 0$ and $y = l$ for $x > 0$. The temperature is zero along the edges $y = 0$, $y = l$ and at infinity. If the edge $x = 0$ is kept at a constant temperature 50ºC, find the temperature distribution $u(x, y)$.

Or

8 Solve any *two* :

(*a*) If $\dfrac{\partial^2 y}{\partial t^2} = c^2 \dfrac{\partial^2 y}{\partial x^2}$ represents the vibrations of a string of length l fixed at both ends, find the solution if :

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

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

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

    (*iv*) $y(x, 0) = k(lx - x^2)$, $0 \le x \le l$.   [7]

(b)   Solve $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = 0$ if   :

   (i) $u(0, y) = 0,$

   (ii) $u(\pi, y) = 0$

   (iii) $u(x, \infty) = 0$ for $0 < x < \pi$

   (iv) $u(x, 0) = u_0$ for $0 < x < \pi$.

(c)   Use Fourier transform to solve the equation $\dfrac{\partial u}{\partial t} = \dfrac{\partial^2 u}{\partial x^2},$

   $0 < x < \infty,\ t > 0$ subject to the following conditions :

   (i) $u(0, t) = 0,\ t > 0$

   (ii) $u(x, 0) = \begin{cases} 1, & 0 < x < 1 \\ 0, & x > 1 \end{cases}$

   (iii) $u(x, t)$ is bounded.   [6]

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

Seat
No.

[5152]-586

S.E. (Chem.) (II Sem.) EXAMINATION, 2017
CHEMISTRY—II
(2015 PATTERN)

Time : Two Hours   Maximum Marks : 50

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

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

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

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

1. (*a*) How does glucose react with :   [6]
   (*i*) Phenylhydrazine
   (*ii*) Bromine-water
   (*iii*) Acetic anhydride.

   (*b*) Draw a diagram showing splitting of *d*-orbitals for transition metal ion in octahedral and tetrahedral field.   [6]

Or

2. (*a*) What is a Zwitter ion ? Describe the isoelectric point. [6]

   (*b*) Explain with reason why ?   [6]
   (*i*) Compounds of transition metals are generally coloured.
   (*ii*) Most of the transition metals are paramagnetic.

3. (*a*) Explain the ways to calculate pH at the equivalence point for :   [4]
   (*i*) Weak acid-strong base and
   (*ii*) Weak base-strong acid.

P.T.O.

(*b*)   What is a redox titration ? Explain direct titration with any *one* example.   [3]

(*c*)   What are the types of adsorption isotherm ? Explain them briefly.   [6]

Or

4. (*a*)   Give a note on "Indicators for redox titration".   [4]

(*b*)   0.04 M sodium cyanide from burette is titrated against 20 ml $AgNO_3$ solution, in the complexometric titration. Find the molarity of $AgNO_3$ solution, if the end point reading is 8.8 ml.   [3]

(*c*)   Explain the role of metal oxide catalysts in organic reactions.   [6]

5. (*a*)   Explain the conformation of butane by Newman projection formula.   [6]

(*b*)   Define the terms :   [6]
(*i*)   Enantiomers
(*ii*) Diastereomers
(*iii*) Racemisation
(*iv*) Mutarotation.

Or

6. (*a*)   What are geometrical isomers ? Give condition, characteristic and example of geometrical isomers.   [6]

(*b*)   Explain Baeyer's strain theory for cycloalkanes.   [6]

7. (*a*)   Give classification of drugs on the basis of mode of action.   [6]

(*b*)   Describe the types of pesticide formulations.   [4]

(*c*)   Give the structural formula, preparation and uses of indole-3-acetic acid.   [3]

Or

8. (*a*) Give the structural formula for the following compounds used as growth regulators : [4]
   (*i*) α-Naphthyl acetic acid
   (*ii*) Gibberellic acid.

   (*b*) Give the synthesis, properties and uses of the following pesticide : [3]
   (*i*) Benzene hexafluoride
   (*ii*) Carbaryl.

   (*c*) Describe the synthesis of aspirin, penicillin G. [6]

Seat No.	

[5152]-590

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

MECHANICAL OPERATIONS

(2015 PATTERN)

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

N.B. :— *(i)* Attempt Question Nos. **1** *or* **2**, **3** *or* **4**, **5** *or* **6**, **7** *or* **8**.

　　　　(ii) 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)* Explain necessity of size reduction.　　　　　　　　　[5]

　　(b) Describe with neat sketches the sedimentation operation. Also sketch typical Commercial equipment.　　　　　[7]

Or

2. *(a)* What will be the power required to crush 150 tons/hr. of limestone of 80% of the feed passes through 2.5 inch

screen and 80% of product passes through 1/8 inch screen ? (Kb = 4.784) [7]

(b) State the assumptions of Kynch theory of sedimentation. [5]

3. (a) Explain different application of fluidisation in detail. [6]

(b) Define mixing and agitation. State the purpose of agitation in chemical process industries. [6]

Or

4. (a) Explain Spouted bed with neat diagram. [4]

(b) Write short note on Muller mixer and Ribbon blender. [8]

5. (a) Describe working of plate and frame filter press with neat sketch. [8]

(b) A rotary drum filter, operating at 0.03 Hz, filters 0.0075 m^3/sec. Operating under the same vacuum and neglecting the resistance of the filter cloth, at what speed must be filter be operated to give a filtration of 0.0160 m^3/sec ? [5]

Or

6. (a) Explain Rotary Vacuum filter with neat sketch. Also write industrial applications. [8]

(b) Enlist the characteristics of Filter media. [5]

7. (*a*) State advantages and limitation of Belt Conveyor. [5]

(*b*) Write short note on Pneumatic conveyor and Screw conveyor. [8]

Or

8. (*a*) Write a note on Chain and flight conveyor. [5]

(*b*) What are various equipments used for storage of solids ? Discuss them with neat sketches. [8]