Total No. of Questions : 8] **SEAT No. :**

P9377 **[Total No. of Pages : 4**

[6179]-1
S.E. (Civil)
ENGINEERING MATHEMATICS - III
(2015 Pattern) (Semester - I) (207001)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, electronic pocket calculator and steam table is allowed.***
5) ***Assume suitable additional data, if necessary.***

Q1) a) Solve any two of the following : **[8]**

i) $\frac{d^3y}{dx^3} + 4\frac{dy}{dx} = \sin 2x$

ii) $\frac{d^2y}{dx^2} + y = \cos ec\ x$ (by method of variation of parameters)

iii) $(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 2\sin\left[\log(1+x)\right]$

b) Solve the following equations by Gauss - Jordan method: **[4]**

$$x_1 + x_2 + x_3 = 9$$
$$2x_1 - 3x_2 + 4x_3 = 13$$
$$3x_1 + 4x_2 + 5x_3 = 40$$

OR

Q2) a) The deflection of a strut with one end built in ($x = 0$) and other supported and subject to end thrust P satisfies the differential equation **[4]**

$$\frac{d^2y}{dx^2} + a^2y = \frac{a^2R}{P}(l - x).$$

Given that $\frac{dy}{dx} = y = 0$ when $x = 0$ and $y = 0$ when x = l. Prove that :

$$y = \frac{R}{P}\left[\frac{\sin ax}{a} - l\cos ax + l - x\right]$$ where al = tan a l.

P.T.O.

b) Apply Runge-Kutta method of fourth order to

Solve $\frac{dy}{dx}=\frac{1}{x+y}$; y(0) = 1 for x = 0.2 taking h = 0.2. **[4]**

c) Solve the following system by Cholesky's method : **[4]**

$$4x_1+2x_2+14x_3=14$$
$$2x_1+17x_2-5x_3=-101$$
$$14x_1-5x_2+83x_3=155$$

Q3) a) The first four moments of a distribution about the value 2 are –2, 12, –20 and 100. Obtain the first four central moments. **[4]**

b) For a normal distribution when mean $\bar{x}=1$, standard deviation $\sigma=3$, find the probability for the interval $-1.43\le x\le 6.19$ [Area for 1.73 is 0.4582 and Area for 0.81 is 0.2910] **[4]**

c) Find the directional derivative of $\phi=x^2+y^2+z^2$ at (1,1,1) along the vector $2\bar{i}+2\bar{j}+\bar{k}$. **[4]**

OR

Q4) a) Number of road accidents on a highway during a month follows poisson distribution with mean 5. Find the probability that in a certain month, number of accidents on the highway will be less than 3. **[4]**

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

i) $\nabla\left(\frac{\bar{a}.\bar{r}}{r^4}\right)=\frac{\bar{a}}{r^4}-4\frac{\left(\bar{a}.\bar{r}\right)\bar{r}}{r^6}$

ii) $\nabla^2\left(\frac{\bar{a}.\bar{b}}{r}\right)=0$ Where $\bar{a}$ & $\bar{b}$ are constant vectors.

c) Show that $\bar{F}=\left(6xy+z^3\right)\bar{i}+\left(3x^2-z\right)\bar{j}+\left(3xz^2-y\right)\bar{k}$ is irrotational. Find scalar ϕ such that $\bar{F}=\nabla\phi$. **[4]**

Q5) Solve any two.

a) Using Green's theorem, show that the area bounded by a simple closed curve C is given by $\frac{1}{2}\int xdy - ydx$ Hence find the area of the ellepsa x = a cosθ, y = b sin θ. **[7]**

b) Use the devergence theorem to evaluate

$\iint_S \left(y^2z^2\hat{i} + z^2x^2\bar{j} + x^2y^2\hat{k}\right).\mathrm{d}\bar{s}$. where, S is the upper part of the sphere $x^2+y^2+z^2 = 9$ above the XOY plane. **[6]**

c) Evaluate $\iint_s (\nabla \times F).d\bar{s}$ *for* $\vec{F} = y\,\hat{i} + z\,\hat{j} + x\hat{k}$. Where S in the surface of the paraboloid Z = $1–x^2–y^2$, Z $\geq$ 0. **[6]**

OR

Q6) Solve any two.

a) If $\vec{F} = \left(2xy + 3z^2\right)\hat{i} + \left(x^2 + 4xz\right)\hat{j} + \left(2y^2 + 6xz\right)\hat{k}$, evaluate $\int_c \vec{F}.d\vec{r}$ where C is the curve x = t, $y = t^2$, $z = t^3$ Joining points (0,0,0) and (1,1,1). **[7]**

b) Show that $\iint \frac{\vec{r}}{r^3}.\hat{n}\,ds = 0$. **[6]**

c) Evaluate $\iint_s curl\ \vec{F}.d\vec{s}$ for the surface of the paraboloid

$z = 9 - \left(x^2 + y^2\right)$ *for* $\vec{F} = \left(x^2 + y - 4\right)\hat{i} + 3xy\ \hat{j} + \left(2xz + z^2\right)\hat{k}$. **[6]**

Q7) Solve any two of the following.

a) Solve :- $\frac{\partial^2 y}{\partial t^2} = \frac{\partial^2 y}{\partial x^2}$, subject to the conditions :- **[7]**

i) y (0,t) = 0

ii) y (l, t) = 0

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

iv) y (x,0) = y_0, 0 < x < l.

b) Solve : $\frac{\partial u}{\partial t} = k\frac{\partial^2 u}{\partial x^2}$, if **[6]**

i) u is finite for all t

ii) u (0,t) = 0

iii) u $(\pi, t) = 0$

iv) u (x,0) = $\pi x - x^2, 0 < x < \pi$

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

OR

Q8) Solve any two of the following.

a) A tightly streteched string with fixed end points x = 0 and x = l is initially in a position given by y (x,0) = $y_0 \sin^3\left(\frac{\pi x}{l}\right)$. If it is released from this position, find the displacement y at any distance x from one end at any time. **[7]**

b) Solve : $\frac{\partial u}{\partial t} = c^2\frac{\partial^2 u}{\partial x^2}$, subject to the conditions : **[6]**

i) $u(x, \infty)$ is finite

ii) $u(x, t) = 0$

iii) $u(l, t) = 0$

iv) $u(x, 0) = x, o < x < l$.

c) Solve : $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, subject to the boundary condition. **[6]**

i) u (0,y) = 0

ii) u (x,0) = 0

iii) u (a,y) = 0

iv) u (x,b) = 40

Total No. of Questions : 8]

SEAT No. : ____

P9378

[Total No. of Pages : 4

[6179]-2
S.E. (Civil)
STRENGTH OF MATERIALS
(2015 Pattern) (Semester-I) (Theory) (201002)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Question No. Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data, if necessary.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Use of cell phone is prohibited in the examination hall.***

Q1) a) A Bar ACB, 5m long is held firmly at A and B as shown in figure 1-a. Bar segment AC has c/s 4cm × 4cm and segment CB has cross section 2cm × 2cm. Modulus of elasticity is 2×10^{11} MPa.

Calculate reactions at A and B when a force of 40kN is applied at C. **[6]**

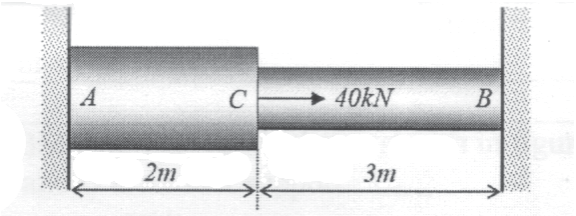


Fig. 1-a

b) Write he bending equation and shear stress equation, staing clearly meaning of each term. Write the assumptions made in the theory of bending. **[6]**

OR

Q2) a) A hole of 20mm diameter is to be cut in an aluminium plate 8mm thick using steel punch. Determine the minimum force to be applied on the punch, if it is known that shear stress at which the aluminium fails is 80 N/mm^2. **[6]**

P.T.O.

b) A section of beam as given below in Fig. 2-b is subjected to a shear force of 100 kN. Draw the shear stress distribution diagram. **[6]**

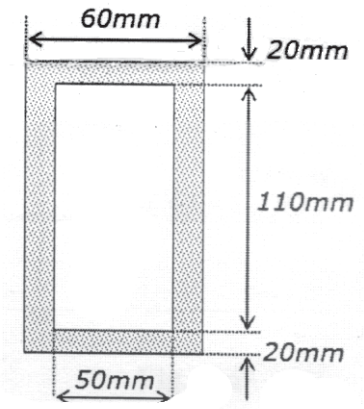


Fig. 2-b

Q3) a) The power transmitted by a solid circular shaft is 75 kW at 200 rpm. If the maximum shear stress allowed is 70N/mm^2, determine the diameter of the shaft such that the maximum torque transmitted in each revolution exceeds the mean torque by 30%. **[6]**

b) At a point in a loaded member, normal stress along X-direction is 80 N/mm^2 along Y-direction is 50 N/mm^2 and shear stress is 20 N/mm^2. Find the stresses on a plane whose normal is inclined at 30^o to the longitudinal axis. Also find the principal stresses. **[6]**

OR

Q4) a) Determine the diameter of shaft to transmit 1MW at 220 rpm if the working conditions to be satisfied are such that; **[6]**

i) The shaft must not twist more than 1^o on L=12 times the diameter and

ii) The shear stress must not exceed 60 N/mm^2.

Take G=84 kN/mm^2.

b) At point in a loaded member, normal stress along x-direction is 60 N/mm^2. tensile, along y-direction is 40 N/mm^2 compressive and shear stress 20 N/mm^2. Find the principal stresses. Also find the maximum shear stress induced. **[6]**

Q5) a) Draw SF and BM diagrams for the beam shown in figure 5-a. A is a hinge support and D is a roller support. **[6]**

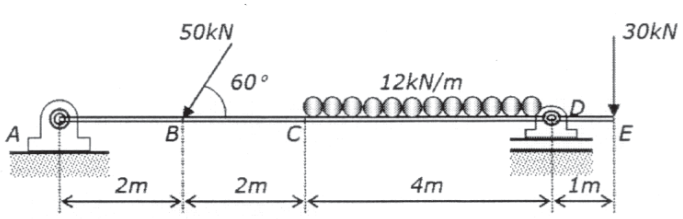


Fig. 5-a

b) Define shear force at a section and bending moment at a section. Prove that the rate of change in shear force equals intensity of loading and that the rate of change in bending moment equals shear force. **[6]**

OR

Q6) a) Draw shear force diagram and bending moment diagram for the beam shown in figure 6-a. B is an internal hinge. Also state he points of contra-flexure, if any. **[6]**

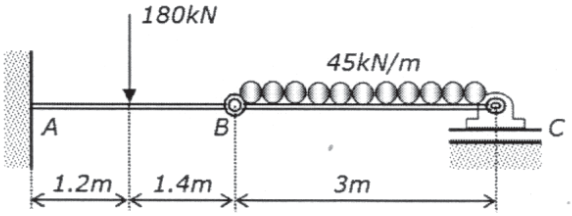


Fig. 6-a

b) Construct loading diagram and bending moment diagram from the following shear force diagram in figure 6-b for a beam. Take AB= 4m and BC = 5m. **[6]**

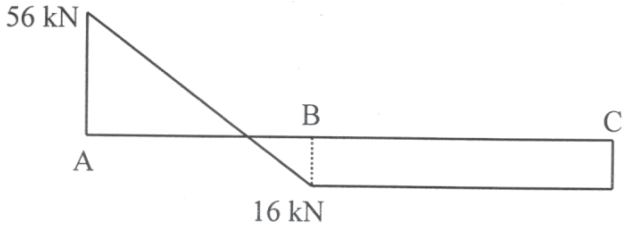


Fig. 6-b

Q7) a) A hollow cylindrical cast iron column 150 mm internal diameter and 25 mm thick is hinged at both ends. For what length of the column would the critical loads by Euler's and Rankine's formulae will be equal to each other? Take $E = 8 \times 10^4$ N/mm^2, $f_c = 550$ N/mm^2 and $\alpha = 1/1600$. **[7]**

b) Explain the term; core of a section. Obtain core section for a hollow circular column wih external diameter D and internal diameter *d*. **[7]**

OR

Q8) a) Compare Euler's critical load and Rankine's crippling load for a hollow cylindrical column of 50 mm external diameter and 5mm thick. The column is of length 2.5 m and both ends of the column are hinged. Take $E = 2 \times 10^5$ N/mm^2. Take $f_c = 350$ kN/mm^2 and $\alpha = 1/7500$. **[7]**

b) A square hollow chimney 24 m high has external dimensions 2.5 m × 2.5 m and internal dimensions 1.25 m × 1.25m. If the wind intensity is 1.3 kN/m^2, calculate the maximum and minimum stresses at the base of the chimney. Take specific weight of the masonary as 20 kN/m^3, and ceofficient of wind pressure C = 1. **[7]**



Total No. of Questions : 8]

SEAT No. :

P9379

[Total No. of Pages : 2

[6179]-3
S.E. (Civil)
GEOTECHNICAL ENGINEERING
(2015 Pattern) (Semester - I) (201003)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Use of calculator is allowed in the examination.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) The initial void ratio of inorganic clay is found to be 0.65, while the specific gravity of solids is 2.68. Determine the dry density of soil. Also determine the bulk density and moisture content if soil is 50% saturated. **[6]**

b) What is flow net? Write down the characteristics and applications of flow net. **[6]**

OR

Q2) a) Write short note on transported soils with examples. **[6]**

b) To find out coefficient of permeability of clay the permeability test was carried out in a variable head permeameter having the diameter of the sample container to be 100 mm. The initial head of water in the stand pipe was found to be 450 mm and it was observed to drop 300 mm in 3 minutes 15 seconds. If the sample be 150 mm high and the diameter of the stand pipe be 19mm, determine the coefficient of permeability of the clay in meter per day. **[6]**

Q3) a) Write a short note on Vane Shear Test with neat sketch and the formulae involved. **[6]**

b) A water tower is supported only on three pillars forming an equilateral triangle with l0m side. The total weight of tower is 1177.2 KN. Calculate vertical stress l0m below the ground level under any one of the pillar. **[6]**

OR

Q4) a) Explain the process of field compaction and its control using proctor needle. **[6]**

b) In a consolidation drained triaxial test a specimen of clay fails at a cell pressure of 60 KN/m^2. The effective shear strength parameters are c'= 15 KN/m^2 and φ' = 20°. Determine the deviator stress of soil. **[6]**

P.T.O.

Q5) a) Explain Coulomb's Wedge theory for determination of earth pressure. **[6]**

b) Determine the active resultant thrust at a depth of 7m in sand whose angle of friction is 25° and density of 17 kN/m^3 in dry state. **[7]**

OR

Q6) a) Discuss Culmann's graphical method for the determination ol active earth pressure. **[6]**

b) Compute the intensity of passive earth pressure at a depth of 8m in cohesion less sand with an angle of internal friction of 30° when water rises to the ground level. Saturated unit weight of sand is 21 KN/m^3, $\gamma_w = 9.81\ KN/m^3$. **[7]**

Q7) a) Discuss the role of soil in geoenvironmental applications and state the process governing containment transport. **[6]**

b) Discuss the criteria for slope classification and explain the modes of Failure for all these slopes. **[7]**

OR

Q8) a) Explain the vacuum extraction technique for in situ treatment of soil contamination. **[6]**

b) What is stabilization-solidification? How is chemical decontamination carried out? **[7]**

Total No. of Questions : 8]

SEAT No. :

P9380

[Total No. of Pages : 3

[6179]-4

S.E. (Civil Engineering)

ARCHITECTURAL PLANNING & DESIGN OF BUILDINGS

(2015 Pattern) (Semester - II) (201005)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4 in the answer-book.***
2) ***Solve Q5 or Q6, Q7 or Q8 on Drawing Sheet only.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if required.***

Q1) a) What are the different zones of land in town planning? Explain in brief the industrial zone. **[5]**

b) Write a short note on benefits of green buildings. **[5]**

c) Explain the-following terms with sketch : **[3]**

i) Building line

ii) Control line

OR

Q2) a) What is development plan? State its objectives and importance. **[5]**

b) Explain 'Transferrable Development Rights' and state its objectives and importance. **[5]**

c) Explain the following principles of architectural planning. **[3]**

i) Utility

ii) Form

iii) Aesthetics

Q3) a) Elaborate need for earthquake resistant structures in relation with loss of human life, property and structure. **[6]**

b) Explain any two acoustical defects in detail? **[6]**

OR

Q4) a) Explain with sketch the following terms **[6]**

i) Station Point

ii) Vanishing point.

b) State different methods of mechanical ventilation. Explain any one in detail. **[6]**

P.T.O.

Q5) Draw a developed plan to a scale of 1:50 or suitable for the line plan as shown. Refer the following guidelines **[12]**

a) The structure is RCC framed structure.

b) Wall thickness: External - 230 mm. Internal - 100 mm

c) Assume suitable sizes of doors and windows.

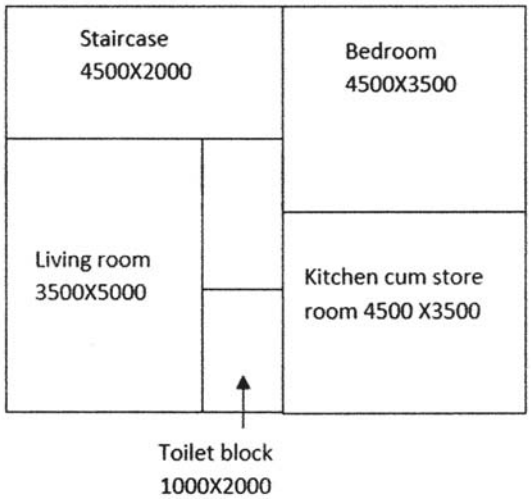
d) Access to the terrace is provided through staircase.

e) Floor to floor height - 3300 mm

f) Plinth height - 600 mm

g) Staircase: Tread - 250mm, landing- 1000mm
Riser - 150mm, width-1000mm.
Passage area connecting rooms - 1000 × 3000 mm

h) All the dimensions are in mm.



OR

Q6) Draw a Line Plan of a residential building having G +1 framed structure with the following requirements. Give schedule of doors and windows. **[12]**
(Refer Table). Indicate N-line. Assume suitable data as applicable.

Sr No	Type of Unit	No. of Units	Area of unit in sq m
1	Living room	1	30
2	Bedroom	2	16 each
3	Master bedroom with attached toilet	1	20
4	Kitchen	1	14
5	WC	1	1.2
6	Bath	1	2.8
7	Staircase	1	Use suitable dimensions
8	Floor to floor height	3.15 m	

Q7) It is proposed to construct a single storeyed shopping complex with the following data: **[13]**

a) Entrance: 3m wide

b) Big shops: 3 nos.: 40 sqm each

c) Small shops: 6 nos.: 30 sqm each

d) ATM booths: 2 nos.: 10 sqm each

e) Separate sanitary blocks for ladies and gents

f) Staircase: suitable size

g) All passages 2.5m wide

Assume any other special requirement if necessary and draw to a scale of 1:50, or suitable Line plan showing locations of doors and windows and Schedule of openings

OR

Q8) Using the following data design a Single storeyed restaurant building (Assumed data, if any, is to be clearly mentioned): **[13]**

Entrance : 3m wide

General stationary shop : 20 m^2

Dining hall : 500 m^2

Service: 35m^2

Kitchen: 50m^2

Store room: 20m^2

Cloak room for keeping baggage : 18m^2

W/c for ladies and gents : 2nos. each

Draw to a scale 1:50 Line plan showing location of doors and windows.

Total No. of Questions : 8]

SEAT No. : ____

P9381

[Total No. of Pages : 3

[6179]-5
S.E. (Civil)
FLUID MECHANICS-I
(2015 Pattern) (Semester-II) (201004)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Answers to the all questions should be written in single answer-book.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, rule, Mollier charts, electronic pocket calculator (non-programmable) and steam tables is allowed.***
6) ***Assume Suitable data, if necessary.***

Q1) a) Define: **[6]**

i) Mass Density

ii) Specific Gravity

iii) Surface Tension

iv) Capillarity

v) Specific Weight and

vi) Specific Volume

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

i) Differential U-tube manometer

ii) Micromanometer.

OR

Q2) a) Explain in brief the following terms along with their significance related to model studies: **[6]**

i) Reynold's Number and

ii) Froude's Number

b) A solid cube of sides of 0.5m each is made of a material of relative density 0.5. The cube floats in a liquid of relative density 0.95 with two of its faces horizontal. Examine its stability. **[6]**

P.T.O.

Q3) a) Derive the Energy Equation with usual notations. **[6]**

b) Explain with neat sketches **[6]**

i) Stream line

ii) Stream tube

iii) Path line

OR

Q4) a) Derive the continuity equation for one dimensional flow along a stream line with usual notations. **[6]**

b) A 200 mm × 100 mm venturimeter is mounted in vertical pipe carrying water, the flow being upwards. The throat section is 200 mm above the entrance section of the venturimeter. For a certain flow through the meter, the differential gauge between the throat and entrance indicates a gauge of deflection of 250 mm (mercury). Assuming the Venturi coefficient as 0.98, find the discharge. **[6]**

Q5) a) A crude oil of viscosity 0.97 Poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 100mm and of length 10m. Calculate the difference of pressure at the two ends of the pipe, if 100 kg of the oil is collected in a tank in 30 seconds. **[7]**

b) Explain: **[6]**

i) Momentum thickness, Displacement thickness and Energy thickness.

ii) Turbulent boundary layer and Laminar sub-layer

OR

Q6) a) In case of flow of viscous fluid through circular pipe; show that the loss of pressure head is given by the following expression: **[7]**

$$\frac{p_1 - p_2}{\rho g} = \left[\frac{32\mu\bar{u}L}{\rho g D^2}\right]$$

b) Find the momentum thickness, displacement thickness and energy thickness for velocity distribution in the boundary layer given by $\frac{u}{U} = \frac{y}{\delta}$, where u is the velocity at a distance y from the plate and u = U at $y = \delta$, where δ = boundary layer thickness. Also calculate the value of $\frac{\delta^*}{\theta}$. **[6]**

Q7) a) Determine the wall shearing stress in a pipe of diameter 100mm which carries water. The velocities at the pipe centre and 30 mm from the pipe centre are 2m/s and 1.5m/s respectively. The flow in pipe is given as turbulent. **[6]**

b) Explain in detail the following terms; **[7]**

i) Major and minor losses in pipe.

ii) Moody's Diagram

OR

Q8) a) Derive the following expression for loss of head in pipes due to sudden enlargement. **[7]**

$$h_e = \frac{V_1 - V_2}{2g}$$

b) Explain the "Prandtl's mixing length theory" for turbulent shear stress.**[6]**



Total No. of Questions : 8]

SEAT No. :

P-9687

[Total No. of Pages : 4

[6179]-6

S.E. (Civil Engineering)

STRUCTURAL ANALYSIS - I

(2015 Pattern) (Semester - II) (201008)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***The use of an elecronic pocket calculator is allowed.***
6) ***The use of cell phones is prohibited in the examination hall.***

Q1) a) A beam of span 4m is simply supported at the ends and loaded as shown in Fig. 1. Using Macaulay's method, determine the slope at end A and deflection under point C. **[6]**

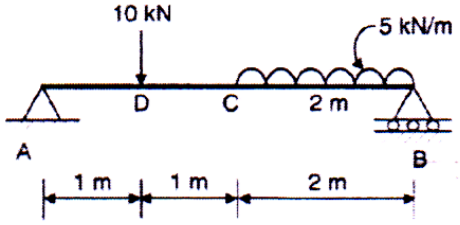


Fig. 1

b) Calculate the reaction at B for the two-span continuous beam ABC shown in Fig. 2 by using Castiglianos Second theorem. *EI* is constant. **[6]**

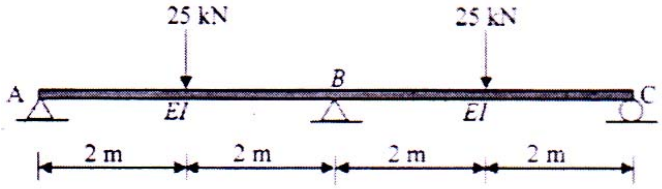


Fig. 2

OR

P.T.O.

Q2) a) A fixed beam of 6m span, carries a load of 80kN at the centre and loads of 50 kN at 1m from each end. Calculate fixed end moments and draw B.M.D. **[6]**

b) Determine the vertical deflection at free end C of the beam ABC shown in Fig. 3 by using Castiglianos Theorem. **[6]**

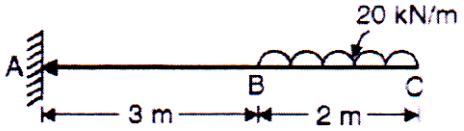


Fig. 3

Q3) a) Determine the horizontal displacement of joint C of the truss shown in the fig. 4 Cross-sectional area of each member is A = 500 mm^2. E = 200 GPa. **[6]**

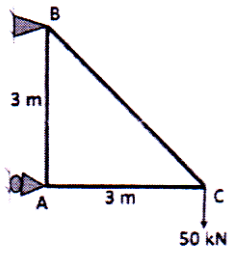


Fig. 4

b) Draw the influence line diagrams for the forces in the members U5U6, U6L5 and U6L6 of the deck type bridge truss shown in Fig. 5. **[6]**

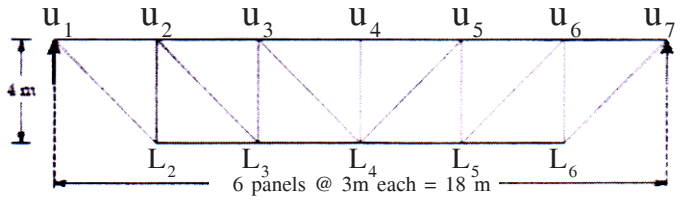


Fig. 5

OR

Q4) a) A beam AB of length 9 m is partly loaded with UDL of 20 kN/m up to 3 m from A and a point load of 30 kN acting at 6 m from A, find reactions using ILD for the beam shown in fig. 6. **[6]**

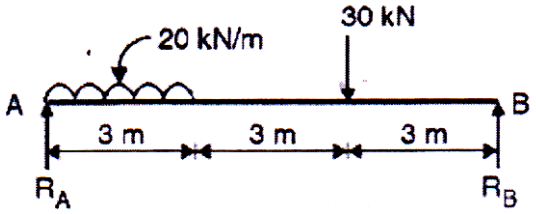


Fig. 6

b) Find the vertical reaction at support D of the truss shown in the fig. 7 Cross-sectional area and modulus of elasticity for all the members are 500 mm^2 and 200 GPa. respectively. **[6]**

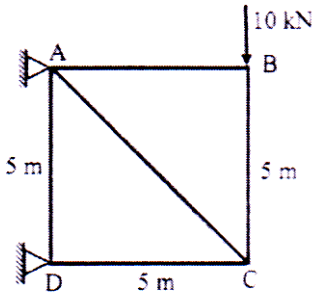


Fig. 7

Q5) A two hinged parabolic arch of span 30 m a rise 6m carries UDL of 20 kN/m on half the span. Find the reactions at the support and draw BMD. **[13]**

OR

Q6) A parabolic arch hinged at the springings and crown has a span of 20 m. The central rise of arch is 4m. It is loaded with udl of 2 kN/m on the left 8 m length. Calculate : **[13]**

a) The direction and magnitude of reaction at the hinges.

b) The bending moment, normal thrust and shear at 4 m and 15 m from the left end.

Q7) a) Explain : **[6]**

i) Plastic Moment

ii) Plastic collapse

iii) Elastic - Plastic behavior of beam

b) Find the collapse load for the following beam. **[7]**

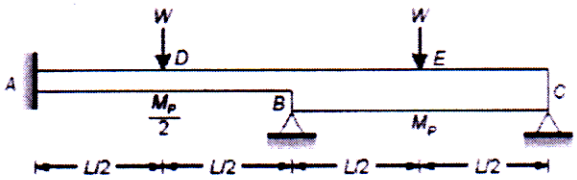


Fig. 8.

OR

Q8) a) Determine shape factor for the following section. **[6]**

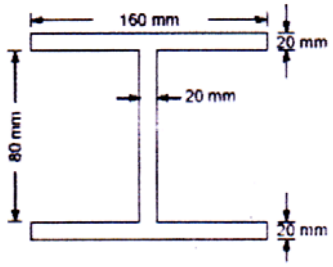


Fig. 9

b) Determine the plastic moment capacity (in kNm) in the portal frame shown in fig 10. The frame has a unifrom cross section throughout. **[7]**

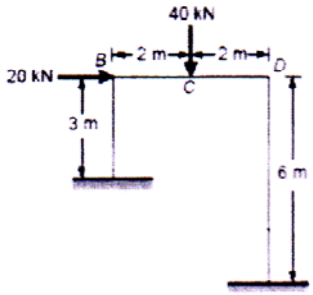


Fig.10

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. : ____

P9382

[Total No. of Pages : 4

[6179]-7
S.E. (Civil Engineering)
CONCRETE TECHNOLOGY
(2015 Pattern) (Semester - II) (201007)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat Diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Use of electronic pocket caculator is allowed.***
6) ***Assume Suitable Data if necessary.***
7) ***Use of IS code 10262, 456 is not allowed.***

Q1) a) Explain with flow diagram, dry process of manufacturing of Portland cement. **[6]**

b) Elaborate slump cone test. Explain with sketch shear slump and collapsible slump. **[6]**

OR

Q2) a) Write short note on : **[6]**

i) Alkali-Aggregate reaction

ii) Compatibility of admixtures

b) Differentiate following: **[6]**

i) Natural and artificial aggregate

ii) Hand compaction and Machine compaction of concrete

Q3) a) Explain pumping of concrete. What are the precautions to be taken during pumping of concrete at high level? **[6]**

b) Explain with sketch stress-strain relationship in concrete. How to improve the elastic properties of concrete? **[6]**

OR

P.T.O.

Q4) Write short note on : **[12]**

a) Creep and shrinkage

b) Fiber Reinforced Concrete

c) Self-compacting concrete

d) NDT on concrete

Q5) a) Explain the following terms used in mix design of concrete; **[7]**

i) Mean strength,

ii) Coefficient of variation

iii) Standard deviation

b) Find out the cement and fly ash content for M25 grade of concrete using DOE method for the following data ; **[6]**

i) W/(C+F) ratio 0.45

ii) Quantity of water required = 210 kg/m^3

iii) Correction in water required due to fly as addition is considered as 15%, Fly ash conforming to IS 38I2 (Part I), specific gravity of fly ash = 2.25, consider Fly content 30%.

OR

Q6) Design a concrete for grade of M25 using IS code method for following data; **[13]**

a) Standard deviation, S = 4,

b) Cement : OPC 53 grade, Specific gravity : 3.15, Maximum cement content : 450 kg/m^3

c) Workability : 50 mm (slump)

d) Exposure condition : Mild (for RCC work)

e) Degree of quality control : Good

f) Coarse aggregate :- crushed stone, Angular, maximum size: 20mm, Specific gravity : 2.7,

Water absorption : 0.81%, water content : Nil

g) Fine aggregate : Natural river sand conforming to grading zone I, Specific gravity : 2.6,

Water absorption : 3.05%, water content : Nil

Table : 1 : - Minimum cement content, maximum W/C and minimum grade of concrete for different exposures with normal weight aggregates of 20 mm nominal maximum size :

Sr. No.	Exposure	Minimum cement Content(kg/m^3)	Maximum W/C	Minimum grade of concrete
i)	Mild	300	0.55	M20
ii)	Moderate	300	0.50	M25
iii)	Severe	320	0.45	M30
iv)	Very severe	340	0.45	M35
v)	Extreme	360	0.40	M40

Table : 2 :- Water Content per m^3 of concrete for 50 mm slump :

Sr. No.	Nominal maximum size of aggregate (mm)	Maximum water content (kg/m^3)
i)	10	208
ii)	20	186
iii)	40	165

Table 3 :- Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate

Sl No.	Nominal Maximum Size of Aggregate mm	Volume of Coarse Aggregate[1] per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate			
		Zone IV	Zone III	Zone II	Zone I
(1)	(2)	(3)	(4)	(5)	(6)
i)	10	0.50	0.48	0.46	0.44
ii)	20	0.66	0.64	0.62	0.60
iii)	40	0.75	0.73	0.71	0.69

[1] Volumes are based on aggregates in saturated surface dry condition.

Q7) a) Explain in brief the carbonation of concrete. How to determine carbonation in hardened concrete? **[6]**

b) What is mean by retrofitting? Explain in brief retrofitting by using FRP. **[7]**

OR

Q8) a) Explain in brief corrosion of reinforcement. What are the precautions to be taken to protect the steel reinforcement in concrete? **[6]**

b) What are the common types of defects present in concrete? Explain in brief Shotcrete. **[7]**

Total No. of Questions : 8]

SEAT No. :

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[6179]-8
S.E. (Civil Engineering)
ENGINEERING GEOLOGY
(2015 Pattern) (Semester - II) (207009)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams should be drawn wherever necessary.***

Q1) a) What is Igneous rocks? Describe classification of Igneous rocks. **[6]**

b) Define Mineral. Describe physical properties of Minerals with suitable examples. **[6]**

OR

Q2) a) Describe various Concordant & Discordant Igneous intrusive bodies with neat diagrams. **[6]**

b) What is meant by Metamorphism? Explain Gneissose and Schistose structure with neat diagram. **[6]**

Q3) a) What are Fold? Describe parts of Folds. **[6]**

b) What is Fault? Give nomenclature of the Fault. Describe types of Fault. **[6]**

OR

Q4) a) Write in detail mineral wealth of Gondwana. **[6]**

b) What is Rejuvenation? Explain two features resulting due to rejuvenation. **[6]**

Q5) a) Explain with appropriate example the feasibility of dam alignment which is crossing a Dyke. **[6]**

b) What are the geological requirements for the foundation of Bridge? **[7]**

OR

P.T.O.

Q6) a) Discuss in detail with a case history how geological investigations have helped for proper site of Dam. **[6]**

b) A site is proposed for excavation of tunnel is A-B and M-N, which is passing through axis and limb region of fold respectively. Justify the suitability of tunnel is such conditions. **[7]**

Q7) a) What is Landslide? What are the causes of it? **[7]**

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

OR

Q8) a) Explain the Geological conditions favorable for natural springs and artesian wells. **[7]**

b) What observations and precautions are necessary during Core Drilling for Preliminary Geological Exploration? **[6]**



Total No. of Questions : 8]

SEAT No. : ____

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[6179]-9

S.E. (Computer Engg.)

DISCRETE MATHEMATICS

(2015 Pattern) (Semester - I) (210241)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Solve Q.1 Or Q.2, Q.3 Or Q.4, Q.5 Or Q.6, Q.7 Or Q.8.***
2) ***Figures to the right indicate full marks.***

Q1) a) Solve the following : **[6]**

i) List all subset of set S = *{a, b, c, d }*

ii) Given two sets A and B, where

A = {3, –6}

B = $\{x : x^2 + 3x - 18 = 0\}$

Prove its equality.

iii) How many integers from 1 to 100 are multiples of 2 and 3.

b) Let S = *{a, b, c, d }* . Consider Partition P = *{{a, b, c},{d}} of S. Find the* equivalence relation R on S determined by P. **[3]**

c) Let A = *{a, b, c, d}* and B = {1, 2, 3}. Determine whether the Relation R from A to B is a function. Justify. If it is a function then give the range. **[3]**

R_1 = [(a,1), (b,2), (c,1), (d,2)]

R_2 = [(a,1), (b,2), (a,2), (c,1), (d,2)]

Where $R_1, R_2 \in R$.

OR

P.T.O.

Q2) a) Briefly Explain Warshall's Algorithm. Compute the transitive closure of given digraph shown in fig 2.a using Warshall's algorithm. **[6]**

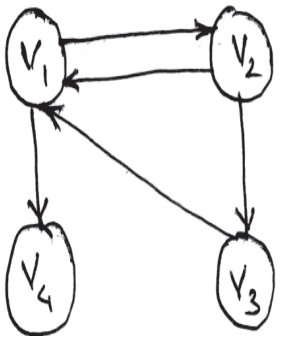


fig 2.a. Graph G(V,E).

b) Discuss the following combinations of set with its definition in set builder from notation and example. **[6]**

i) Union of sets

ii) Intersection of sets

iii) Difference of sets

iv) Symmetric Difference of sets

Q3) a) A committee including 3 boys and 4 girls is to be formed from a group of 10 boys and 12 girls. How many different committees can be formed from the group. **[4]**

b) How many arrangements can be made with the Letter of the word "CALCULATOR". In how many of these arrangement, vowels occur together **[4]**

c) Define Directed Graph G(V,E). Define the connectedness in a directed graph with suitable examples for the follwoing : **[4]**

i) Weakly Connected Graph

ii) Unilateral Connected Graph

iii) Strongly Connected Graph.

OR

Q4) a) Define the following with suitable graph example. **[4]**

i) Complete Graph

ii) Regular Graph

iii) Null Graph

iv) Bi-Partite Graph

b) Compute the shortest path from a to 3 using Dijkstra's Algorithm. as shown in fig 4.6. **[4]**

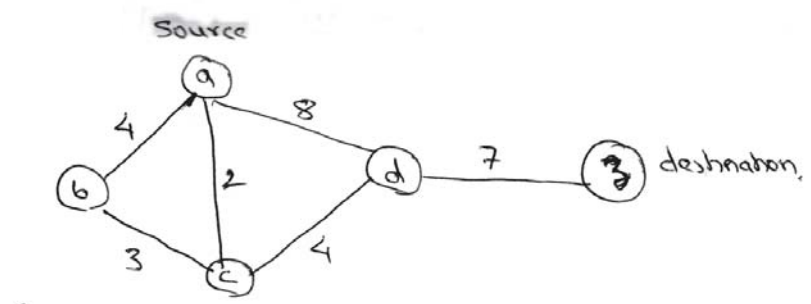


fig 4.6 Graph G4(V,E).

c) Find n and r. **[4]**

if ${}^{n}C_{r-1} : {}^{n}C_{r} : {}^{n}C_{r+1} = 14 : 8 : 3$

Q5) a) Determine Minimum Spanning Tree (MST) for a given graph shown in fig 5.a using Kruskal's algorithm. Calculate total cost of MST. **[7]**

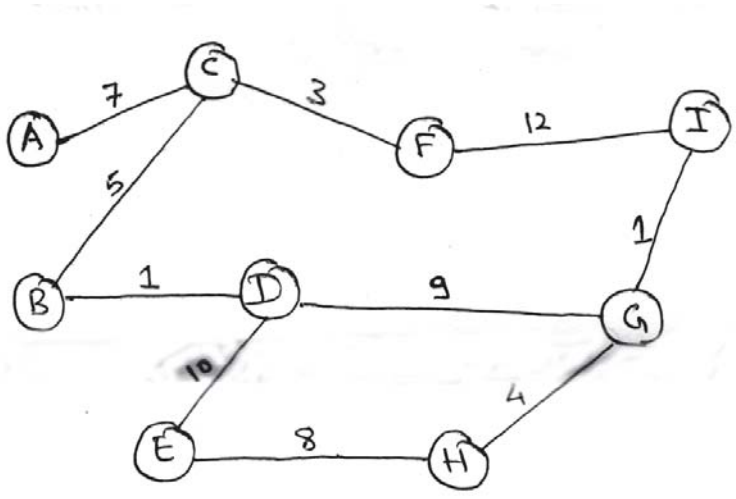


fig 5.a> Graph G(V,E)

b) Check whether the given set is a Prefix code or not. Draw the binary tree for the same. **[3]**

{000, 001, 01, 10, 11}

c) Define with example : **[3]**

i) Level and height of a tree

ii) Binary Search tree

iii) Spanning tree

OR

Q6) a) Discuss the transport Network. Compute the maximum flow in the transport Network shown in fig 6. a) from 'a' to 'z'. **[7]**

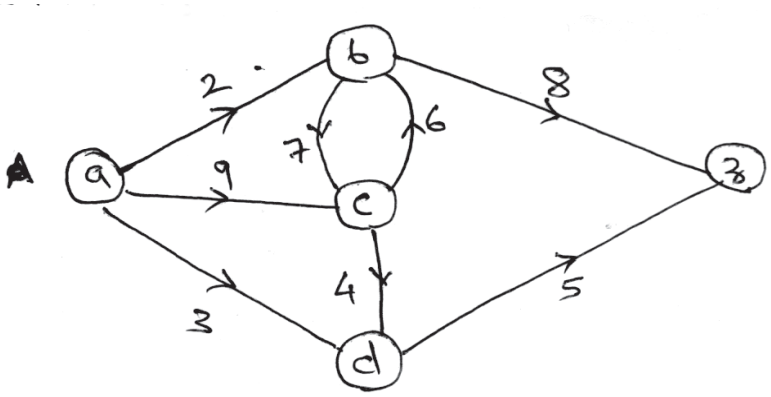
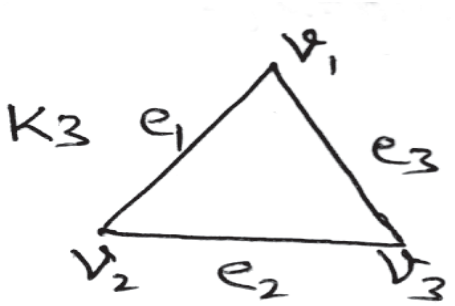


fig 6a) Graph G6(V,E).

b) Draw all spanning trees for K3. **[3]**



c) Discuss the application of trees. **[3]**

Q7) a) Let $(Q^+, *)$ is an algebraic system, where Q^+ = set of all positive rational number and '*' is defined as. **[7]**

$$a * b = \frac{ab}{3}$$

Show that $(Q^+, *)$ is an Abelian Group.

b) Describe the following terms with examples: **[6]**

i) Homomorphism

ii) Rings

iii) Ring with and without zero divisor

OR

Q8) Define Algebraic System and check for the following algebraic structures: **[13]**

a) (Z, *) where * is defined as $a*b$ = max (a, b) [max function gives maximum of two operands] check whether (Z, *) is a semigroup or not.

b) (N, *) is a Group or not.

c) (N, +, *) is a Ring or not.

d) $(a+b\sqrt{2}, +, *)$ where a, b, $\in$ R is integral domain or not.



Total No. of Questions : 8]

SEAT No. : ____

P9385

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[6179]-10

S.E. (Computer Engineering)

DIGITAL ELECTRONICS & LOGIC DESIGN

(2015 Pattern) (Semester-I) (210242)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Assume Suitable data if necessary.***

Q1) a) A simplify following expression using K map and implement using basic gate F = Σm (1,4,8,12,13,15) +d (3,14) **[4]**

b) What is the difference between truth table and excitation table of flip flop? Write truth table and excitation table of JK flip flop. **[4]**

c) Implement the following expression using single 8:1 multiplexer. **[4]**

Y (A,B,C,D)= Σm (0,2,3,6,8,9,12,14)

OR

Q2) a) Draw a neat circuit diagram of a 3-bit Johnson counter. Draw the relevant output waveforms. **[4]**

b) Draw and explain the logical diagram of a 4-bit parallel in and serial out shift register. **[4]**

c) Explain block diagram of Asynchronous counter IC 7490. Also draw the diagram for divide-by-7 counter using 7490. **[4]**

Q3) a) Write in VHDL entity declaration for NAND gate. **[2]**

b) Draw the ASM chart for the following state machine. A 2-bit up counter is to be designed with output AB and enable 'X'. if 'X'=0, then counter changes the state as 00-01-10-11-00. **[4]**

If 'X' = 1, then counter should remain in current state.

c) Design and implement full adder using PLA. **[6]**

OR

P.T.O.

Q4) a) Write VHDL code for full subtractor using data flow modelling style. **[4]**

b) Compare data flow and behavioural modelling style of modelling in VHDL **[2]**

c) Realize the following function using PAL and draw the logic diagram using PAL. **[6]**

$F(A,B,C) = \Sigma m (3,4,5,7)$

$G(A,B,C) = \Sigma (1,3,5,6,7)$

Q5) a) Explain with neat diagam working of CMOS inverter. **[5]**

b) Explain the working of basic TTL NAND gate with suitable diagram. List three types of output configurations. **[8]**

OR

Q6) a) List the differences between CMOS and TTL logic family. **[5]**

b) Define the following terms and mention its standard values for TTL logic family: **[8]**

i) Voltage Parameters

ii) Power Dissipation

iii) Fan out

iv) Noise Margin

Q7) a) Explain any 3 addressing modes of 8051. with example. **[3]**

b) What is difference between timer and counter. Draw and explain format of TMOD register. **[6]**

c) Explain the function of following pins: **[4]**

i) (EA)

ii) (PSEN)

iii) RST

iv) ALE

OR

Q8) a) Explain following instruction of microcontroller 8051 **[5]**

MOVX, MOVC, ADDC, JNB, DJNZ

b) State the features of 8051 microcontroller. **[4]**

c) Differentiate between microprocessor and microcontroller. **[4]**

❖ ❖ ❖

Total No. of Questions : 8]

SEAT No. :

P9386

[Total No. of Pages : 2

[6179]-11
S.E. (Computer Engineering)
DATA STRUCTURES AND ALGORITHMS
(2015 Pattern) (Semester - I) (210243)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Define algorithm and its characteristics. **[3]**

b) Write pseudo C/C++ code to perform simple transpose of sparse matrix. **[3]**

c) Explain the algorithmic strategy of divide and conquer. Explain its application in binary search. **[6]**

OR

Q2) a) Define and explain the following terms: **[3]**

i) Linear data structure and Non-linear data structure

ii) Time complexity

iii) Space complexity

b) Explain the Asymptotic notation Big O, Omega and Theta with suitable example. **[3]**

c) Explain fast transpose of sparse matrix with suitable example. Discuss the time complexity of fast transpose. **[6]**

Q3) a) Write pseudo C/C++ code to represent doubly linked list as an ADT. **[6]**

b) Explain the stepwise conversion using stack for the given infix expression to the postfix expression: **[6]**

A *(B + C + D)

OR

P.T.O.

Q4) a) Write pseudo C/C++ code to represent stack as an ADT. **[6]**

b) Write an algorithm to perform the following operation on singly linked list: Reverse operation without using recursion. **[6]**

Q5) a) Define the following terms with examples **[6]**

i) Input Restricted dequeue

ii) Output Restricted dequeue

b) Write pseudo C/C++ code to implement queue using linked list. **[7]**

OR

Q6) a) Explain double ended queue with suitable example. Explain all operations on it. **[6]**

b) Write pseudo C/C++ code to implement circular queue operations. **[7]**

Q7) a) Sort the following numbers using Merge sort **[7]**

55, 85, 45, 11,34,05,89,99,67

Discuss its time complexity and space complexity.

b) Explain sequential search and binary search with appropriate example. Comment on their data organization, time complexity and space complexity **[6]**

OR

Q8) a) Explain the algorithm of Quick sort with suitable example. Discuss its time complexity and space complexity. **[7]**

b) What is heap? Explain heap sort with suitable example. State its complexity. **[6]**

Total No. of Questions : 8]

SEAT No. : ____

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[6179]-12
S.E. (Computer)
COMPUTER ORGANIZATION AND ARCHITECTURE
(2015 Pattern) (Semester - I) (210244) (Theory)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of calculator is allowed.***

Q1) a) Apply booth's Algorithm to multiply the following numbers **[6]**

Multiplicand : +12

Multiplier : -7

b) Explain Direct cache mapping technique with advantages and disadvantages. **[6]**

OR

Q2) a) Define following any three terms **[6]**

i) Cache memory

ii) Cache hit

iii) Cache miss

b) Represent 335.2350_{10} in single precision and double precision formats. **[6]**

Q3) a) Differentiate between Memory Mapped I/O and I/O mapped I/O. **[6]**

b) Explain following addressing modes with example of each. **[6]**

i) Immediate addressing

ii) Register addressing

iii) Auto increment

OR

P.T.O.

Q4) a) Explain types of instructions according to operations and number of address. Give examples. **[6]**

b) Compare programmed I/O and Interrupt driven I/O. **[6]**

Q5) a) Draw and explain instruction cycle in detail? **[6]**

b) Draw and explain the functional block Diagram of 8086. **[7]**

OR

Q6) a) Compare Superscalar and super pipelined approaches in superscalar processor. **[6]**

b) List and explain various ways in which an instruction pipeline can deal with conditional branch instructions. **[7]**

Q7) a) Compare Hardwired control and micro programmed control. **[6]**

b) Draw and explain single bus organization of CPU. **[7]**

OR

Q8) a) Write a control sequence for the following instruction for single bus organization SUB (R2), R1. **[7]**

b) List any four applications of micro programming. **[6]**

Total No. of Questions : 8]

SEAT No. :

P9388

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[6179]-13
S.E. (Computer)
OBJECT ORIENTED PROGRAMMING
(2015 Pattern) (Semester - I) (210245)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Answer Question 1 or 2, 3 or 4, 5 or 6, 7 or 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain the following **[3]**

i) Encapsulation

ii) Abstraction

iii) Message passing

b) Explain the different types of constructor? Can we overload the constructor? If yes then justify it. **[9]**

OR

Q2) a) Consider the following C++ declaration and answer the questions given below: **[8]**

```
Class A
    {
    void any();
    protected:
      int a,b;
     void proc();
public:
    A( );
    void get();
    void put();
};
class B:protectedA
{
    int c, d;
```

P.T.O.

```
protected:
    int e,f;
    void get2( );
    public:
      B( );
     void put2( );
};
class C: private B
{
      int p;
    protected:
      int q;
      void get3( );
    public:
     void show3( );
};
```

i) Name all the member functions which are accessible by the objects of class C.

ii) Name all the protected members of class B

iii) Name all the data members which are accessible from member fimctions of class C

iv) How many bytes does an object belonging to class C require?

v) Which class constructor will be called first at the time of declaration of an object of class C

vi) Is the member function proc() can be accessed from the objects of classC

vii) Name the base class and derived class of class B

viii) Name all the protected members of class C

b) Explain the dynamic memory allocation in c++? **[4]**

Q3) a) How smart pointers avoids the problem of memory leak. **[4]**

b) Explain shared pointers. **[3]**

c) What is generic programming? How it is implemented in C++. **[5]**

OR

Q4) a) Write a program using function template to perform the multiplication of two matrices. **[8]**

b) Explain the significance of Static keyword in programming Proper Explanation of significance. **[4]**

Q5) a) Explain ofstream, ifstream, and fstream classes for file I/O with example. **[6]**

b) Write a program to overload insertion (<<) and extraction (>>) operator in C++. **[7]**

OR

Q6) a) What are various functions which are used to manipulate file pointer? **[7]**

b) What is a Stream?Explain types of Streams available in C++. **[6]**

Q7) a) What is the purpose of iterator? Elaborate forward, bidirectional and random-access iterators with suitable examples. **[7]**

b) Write a program to implement Map using STL. **[6]**

OR

Q8) a) Use minimum 8 functions of vector STL. Write a program to explain the same. **[6]**

b) What is the STL? Why should a C++ programmer be interested in the STL? What is the design philosophy of the STL? What are the major components of the STL? **[7]**



Total No. of Questions : 8] **SEAT No. :**

P9389 **[Total No. of Pages : 3**

[6179]-14
S.E. (Computer Engineering / IT)
ENGINEERING MATHEMATICS - III
(2015 Pattern) (Semester - II) (207003)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Your answers will be valued as a whole.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

Q1) a) Solve any two of the following : **[8]**

i) $(D^2-3D+2)y = \sin 2x + 5^x$

ii) $(D^2+4)\,y = \text{cose } c2x$ (use method of variation of parameters)

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

b) Find the Fourier sine transform of **[4]**

$$f(x) = \begin{cases} x^2, & 0 \le x \le 1 \\ 0, & x \ge 1 \end{cases}$$

OR

Q2) a) An electrical circuit consist of an inductance 0.1 henry, a resistance R of 20 ohms & a condenser of capacitance C of 25 microfards. If the diff.eq^n of electric circuit. **[4]**

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

Then find the charge q and current i at any time t, given that when t = 0, q = 0.05 columbs & $i = \frac{dq}{dt} = 0$.

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

i) Find $Z\{\cos(3k+2)\}k \ge 0$

ii) Find $Z^{-1}\left\{\frac{2z^2+3z}{(z+2)(z-4)}\right\}$

c) Solve $y_{k+2} + 6\,y_{k+1} + 9\,y_k = 2^k$, $y_0 = y_1 = 0$ using Z transform. **[4]**

P.T.O.

Q3) a) The first four moments of a distribution about the value 5 are 1, 2,4 and 6. Obtain the first four central moments. β_1 & β_2. **[4]**

b) Fit a straight line of the form y = ax+b to the following data by the least squares method. **[4]**

x	–1	0	2	4	7	8
y	2	1	3	–1	2	4

c) If 10% of bolts produced by a machine are defective. Defermine the probability that out of 10 bolts, chosen at random. **[4]**

i) exactly one

ii) none

iii) at most two, bolts will be defective.

OR

Q4) a) The height of a student in a school follows a normal distribution with mean 190 cm and variance 80 cm. Among the 1,000 students from the school, how many are expected to have height above 200 cm? **[4]**

[Given : z = 1.118, Area = 0.3686]

b) Using prisson distribution, find the probability that the ace of spades will be drawn from a pack of well shuffled cards of least once in 104 consecutive trials. **[4]**

c) The two regression equations of the variables x & y are x = 19.13 –0.87y and y = 11.64 –0.50 x. **[4]**

Find

i) Mean of x's

ii) Mean of y's

iii) The correlation coefficient between x & y

Q5) a) In what direction from the point (2,1,–1) is directional derivative of $\phi = x^2yz^3$ maximum, what is its magnitude? **[4]**

b) Show that $\overline{F} = \dfrac{xi + yj}{x^2 + y^2}$ is solenoidal as well as irrotational. **[4]**

c) Evaluate line integral $\int_c \overline{F}.d\overline{r}$ where $\overline{F} = \left(2xy + z^3\right)\overline{i} + x^2\overline{j} + 3xz^2\overline{k}$ along the st.line joining (1, –2, 1) and (3,1,4). **[5]**

OR

Q6) a) Find the angle between tangents to the curve **[4]**

$\bar{r} = (t^3 + 2)\bar{i} + (4t - 5)\bar{j} + (2t^2 - 6t)\bar{k}$ at t = 0 and t = 2

b) Show that (any one) **[4]**

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

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

c) Evaluate $\int_c \bar{F}.d\bar{r}$ where $\bar{F} = (2y + 3)\bar{i} + xz\,\bar{j} + (yz - x)\bar{k}$ & C is the curve $x = 2t^2$, $y = t$, $z = t^3$ from t = 0 to 1. **[5]**

Q7) a) If $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$, Find its harmonic conjugate v & write function f (z) = u+iv in terms of z. **[4]**

b) Evaluate $\oint_c \frac{2z^2 + 2z + 1}{(z+1)^3 (z-3)} dz$ where c is contour $|z + 1| = 2$. **[5]**

c) Find bilinear transformation which maps z = –1, 0, 1 on to W=0, i, 3i. **[4]**

OR

Q8) a) Show that $F(z) = z^2 \bar{z}$ is not an analytic function. **[4]**

b) Evaluate $\int_0^{2\pi} \frac{\sin^2 \theta}{5 + 4\sin\theta} d\theta$ suing Residue them. **[5]**

c) Given $w = z^2$, show that st. line in z–plane through origin maps onto the st. line in w plane through origin. **[4]**

Total No. of Questions : 8]

SEAT No. :

P9390

[Total No. of Pages :2

[6179]-15
S.E. (Computer Engineering)
COMPUTER GRAPHICS
(2015 Pattern) (Semester-II) (210251)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Write and explain Bresenham's Line drawing algorithm and find out which pixel would be turned on for the line with the end points (3,2) to (7,4) using the same? **[7]**

b) Explain Cohen-Sutherland line clipping algorithm with example. **[5]**

OR

Q2) a) Explain DDA line drawing algorithm. Consider line segment from A(– 2, –1) to B(6, 3) use DDA line drawing algorithm to rasterize this line. **[6]**

b) Explain polygon fill with seed fill algorithm **[6]**

Q3) a) Write short note on followings: **[6]**

i) Morphing

ii) Design of animation sequence

iii) CIE chromaticity diagram

b) Explain how to perform rotation about arbitrary axis in 3D with diagram. **[6]**

OR

Q4) a) Explain RGB and HSV color models **[6]**

b) For origin centered unit square, rotate 45º clockwise, scale by a factor 2 in x–direction. Find resultant coordinates of square (write required matrices). **[6]**

P.T.O.

Q5) a) Explain light sources, ambient light, specular reflection and diffuse reflection. **[7]**

b) Explain Phong Shading Algorithm. **[6]**

OR

Q6) a) Explain Gaurad Shading algorithm. **[6]**

b) Write short notes on the following back face removal algorithm: **[7]**

i) Painter's algorithm

ii) Z-buffer.

Q7) a) Draw block diagram of NVIDIA workstation and explain it in brief. **[7]**

b) Write short note on blending function of Bezier curve. **[6]**

OR

Q8) a) Write short notes on (**any two**): **[7]**

i) Koch curve

ii) B-spline curve

iii) Architecture of i86O.

b) What is open GL? Write any three 3D transformation Function of open GL **[6]**



Total No. of Questions : 8]

SEAT No. :

P9391

[Total No. of Pages : 2

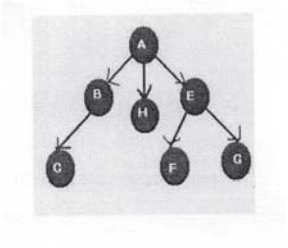
[6179]-16
S.E. (Computer)
ADVANCED DATA STRUCTURES
(2015 Pattern) (Semester - II) (210252)

Time : 2 Hours] *[Max. Marks : 50*

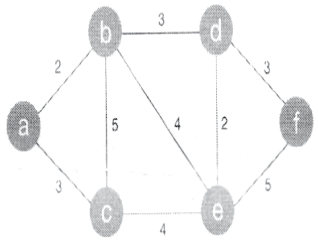
Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Convert following general tree to binary tree. (1M each step) **[6]**



b) Construct MST from the given data using Prims Algorithm. (1M each step) **[6]**



OR

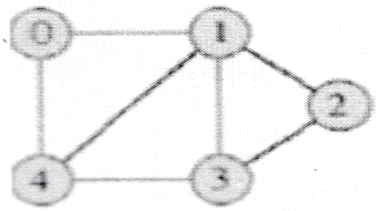
Q2) a) Construct binary tree from given traversals. Show stepswise construction of a tree. **[6]**

Inorder : August, April, Sept, Feb, May, Jan, June, March, July

Preorder : Jan, Feb, April, August, Sept, May, March, June, July

P.T.O.

b) Represent the following graph using adjacency matrix and adjacency list. Write pros and cons of both the methods. **[6]**



Q3) a) Explain concept of extendible hashing with example. **[6]**

b) Construct AVL tree for the sequence of numbers: 1,2,3,4,8,7,6,5,11,10,12 **[6]**

OR

Q4) a) What is symbol table? Explain types of symbol table with suitable example. **[6]**

b) What is collision? State and explain different collision resolution strategies used in hashing. **[6]**

Q5) a) Create a max heap for 20, 14. 50, 3, 5, 7, 11, 8, 12, 15. Show all the steps. **[8]**

b) Calculate the cost of BST - **[6]**

Input: keys[] = {10, 12, 20}, freq[] = {34, 8, 50}

OR

Q6) a) Construct a B-tree of order 5 for the given data: **[8]**

78, 21, 14, 11, 97, 85, 74, 63, 45, 42, 57, 20, 16

b) Write an ADT of set. **[6]**

Q7) a) Explain multilist files and coral rings with suitable example. **[6]**

b) List and explain types of indexes. **[6]**

OR

Q8) a) Explain structure of indexed Sequential file. List any six characteristics of indexed Sequential file. **[6]**

b) List and explain different primitive operations on sequential file organization. (1 M each) **[6]**

◀▶ ◀▶ ◀▶

Total No. of Questions : 8]

SEAT No. : ____

P9392

[Total No. of Pages : 2

[6179]-17
S.E. (Computer)
MICROPROCESSOR
(2015 Pattern) (Semester - II) (210253)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) With example explain "Immediate addressing mode" of 80386. **[2]**

b) List and explain any four string instructions of 80386. **[4]**

c) List all features which made 80386, an advanced processor. **[6]**

OR

Q2) a) List memory - management registers of 80386. **[2]**

b) Draw and explain the format of a Page Table Entry. **[4]**

c) With help of diagram explain the 80386 mechanism to translate linear address to physical address. **[6]**

Q3) a) List different aspects of protection in 80386. **[2]**

b) Define DPL, RPL and CPL. Where these fields are present? **[4]**

c) Explain static and dynamic fields of 80386 Task State Segment (TSS). **[6]**

OR

Q4) a) Define "Traps". **[2]**

b) Briefly explain interrupts and exceptions. **[4]**

c) Explain the role of I/O Permission Bit Map in providing protection for I/O functions. **[6]**

P.T.O.

Q5) a) With the necessary diagrams explain entering and leaving V86 mode? **[7]**

b) What all initializations required to start processor in real mode after reset? **[6]**

OR

Q6) a) Explain features of "Virtual 8086 mode". **[3]**

b) Explain 80386 processor state after RESET. **[4]**

c) Draw and explain debug control and status registers (DR6 & DR7) of 80386. **[6]**

Q7) a) Draw and explain read cycle with pipelined address timing. **[8]**

b) List the 80387 signals involved in interfacing it with 80386. **[3]**

c) Explain following signals. **[2]**

i) LOCK#

ii) ADS#

OR

Q8) a) Draw and explain 80387 register stack. **[5]**

b) Draw and explain read cycle with non-pipelined address timing. **[8]**

Total No. of Questions : 8]

SEAT No. :

P9393

[Total No. of Pages : 2

[6179]-18
S.E. (Computer)
PRINCIPLES OF PROGRAMMING LANGUAGES
(2015 Pattern) (Semester - II) (210254)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***All questions are compulsory.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***

Q1) a) Describe built-in data types. Identify' the benefits of implementing them in Programming Languages. List the built-in data types implemented in Java. **[7]**

b) Define Semantics. Enlist the different types of Semantics? What are the advantages of Axiomatic Semantics? **[6]**

OR

Q2) a) List various activities carried out in the process of Interpretation. With neat diagram explain the purpose of each activity. **[7]**

b) What are the steps in Software Development? How does Software Development take care of efficiency quality attribute of the programming language? **[6]**

Q3) a) Define Modularity? What are the advantages of modularity in software design? Which features of Java help in providing modularity? **[6]**

b) What are the challenges for programming in large? Explain how they are addressed by programming language. **[6]**

OR

Q4) a) What is Generic Programming? Demonstrate with suitable program how generic programming is implemented in C++. **[6]**

b) Demonstrate through a program in Java how constructors can be used for initializing the elements of matrix with '0' in the example on Addition of 2 Matrices. **[6]**

P.T.O.

Q5) a) Describe Polymorphism. List the different types of Polymorphism. Which type of polymorphism is method overriding? Demonstrate method overriding through a program in Java. **[7]**

b) Describe Inheritance. List and explain the different types of Inheritance. Demonstrate through programming example how Java supports Multiple Inheritance? **[6]**

OR

Q6) a) Explain the Significance of keyword final in Java? Demonstrate with example each of the case. **[6]**

b) Describe Constructors. Demonstrate with suitable example the different types of constructors used in Java. **[7]**

Q7) a) Describe an Applet? Differentiate between an Applet and a normal Application Program. With neat diagram explain Life cycle of an Applet.**[8]**

b) Demonstrate use of methods in PrintStream Class to implement Student Information system. **[2]**

c) Describe the mechanism used for garbage collection in Java? **[2]**

OR

Q8) a) Describe Exceptions. Illustrate how exceptions are handled in Java. **[6]**

b) What is meant by Streams in Java? How does Java manage Input/Output using Streams? Differentiate ByteStream, CharacterStream and PredefinedStream? **[6]**



Total No. of Questions : 8] **SEAT No. :**

P9394 **[Total No. of Pages : 3**

[6179]-19
S.E. (Electrical)
ENGINEERING MATHEMATICS - III
(2015 Pattern) (Semester - I) (207006)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Solve any two: **[8]**

i) $(D^2 - 5D + 6)\, y = 3\, e^{5x}$

ii) $(D^2 + 1)y = \text{cosec}x$ by variation of parameters method

iii) $x^2 \frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + 6y = x^5$

b) Solve by Laplace transform method **[4]**

$y'' + y = t$, $y(0) = 1$, $y'(0) = -2$

OR

Q2) 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 : **[4]**

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

then find the charge q at any time t.

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

i) Find $L(e^{-2t}\, t \sin 2t)$

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

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

$$\int_0^\infty te^{-2t} \sin 3t\, dt$$

P.T.O.

Q3) a) Find the fourier transform of **[4]**

$$f(x)=\begin{cases}1-x^2, & |x|\le 1\\ 0 \quad , & |x|>1\end{cases}$$

b) Attempt any one **[4]**

i) Find the Z-transform of $f(k)=\dfrac{3^k}{k!},\ k\ge 0$

ii) Find inverse Z - transform of $\mathrm{F}(z)=\dfrac{z}{(z-1)(z-2)}, |z|\ge 2$ by using partial fraction method.

c) Find the directional derivative of $\phi = xy + yz$ at (1, 1, 1) along the vector $\bar{a}=\bar{i}+2\bar{j}+3\bar{k}$. **[4]**

OR

Q4) a) Attempt any one **[4]**

i) For any constant vector $\bar{a}$ show that $\nabla\left(\dfrac{\bar{a}.\bar{r}}{r^n}\right)=\dfrac{\bar{a}}{r^n}-\dfrac{n(\bar{a}.\bar{r})}{r^{n+2}}\bar{r}$

ii) Show that $\nabla.\left(\dfrac{\bar{a}\times\bar{r}}{r}\right)=0$.

b) Show that vector field $\bar{\mathrm{F}}=(x^2-yz)\bar{i}+(y^2-zx)\bar{j}+(z^2-xy)\bar{k}$ is irrotational. Also find scalar potential ϕ such that $\bar{\mathrm{F}}=\nabla\phi$. **[4]**

c) Obtain $f(k)$, given that $f(k+1)+\dfrac{1}{2}f(k)=\left(\dfrac{1}{2}\right)^k, k\ge 0,\ f(0)=0$. **[4]**

Q5) Attempt any <u>Two</u>

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

b) Using divergence theorem, show that $\iiint_V \frac{1}{r^2}dv=\iint_S \frac{1}{r^2}\bar{r}.d\bar{s}$ where S is a closed surface enclosing the volume V. **[6]**

c) Verify stoke's theorem for $\bar{F} = -y^3 i + x^3 j$ and the closed curve C is the boundary of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. **[7]**

OR

Q6) Attempt any Two

a) Find the work done in moving a particle once round the ellipse $x = 5\cos\theta$, $y = 4\sin\theta$, $z = 0$ under the field of force

$\bar{F} = (2x - y + 2)i + (x + y - z^2)j + (3x - 2y + 4z)k.$ **[6]**

b) Use divergence theorem to evaluate $\iint_S (x^3 i + y^3 j + z^3 k).d\bar{s}$ where S is surface of the sphere $x^2 + y^2 + z^2 = 1$. **[6]**

c) Use stoke's theorem to evaluate $\int_C (4yi + 2zj + 6yk).d\bar{r}$ where C is the circle $x^2 + y^2 + z^2 - 2z = 0$, $x - z + 1 = 0$. **[7]**

Q7) a) Show that if $F(z) = u + iv$ is analytic then both u and v are harmonic. **[4]**

b) Evaluate: $\oint_C \frac{z}{(z-1)(z-2)^2} dz$, where C is $|z| = 3/2$. **[4]**

c) Find the bilinear transformation that maps the points $z = \infty, 0, i$ into the points $w = 0, \infty, i$. **[5]**

OR

Q8) a) If $F(z) = u + iv$ is analytic and $u = 2x - 2xy$ Find harmonic conjugate of u. **[4]**

b) Evaluate : $\oint_C \frac{3z+4}{z(z+2)} dz$ where C is $|z| = 1$. **[4]**

c) Find image of $x = 0$, $y = 0$ under the transformation $w = z^2$ **[5]**

Total No. of Questions : 8]

SEAT No. :

P9395

[Total No. of Pages :2

[6179]-20
S.E. (Electrical Engineering)
POWER GENERATION TECHNOLOGIES
(2015 Pattern) (Semester-I) (203141)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicates full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) Explain Carnot cycle with PV and TS Diagram. **[6]**

b) Explain site selection of thermal Power Plant. **[6]**

OR

Q2) a) Explain working of Electrostatic precipitator with neat sketch. **[6]**

b) With help of neat diagram explain nuclear Power Plant. **[6]**

Q3) a) Explain significance of Flow duration curve and hydrograph **[6]**

b) Describe small, mini and micro hydro power plant **[6]**

OR

Q4) a) Describe functions of Spillway and Dam **[6]**

b) Classify different types of Wind turbine. Explain any one with diagram. **[6]**

Q5) a) Draw equivalent circuit diagram and I-V curve of a PV cell. **[6]**

b) Write different the types of collectors. Explain any one with diagram. **[7]**

OR

Q6) a) Explain impact of temperature and isolation on I-V curve of a PV cell. **[6]**

b) What are the Advantage and disadvantages of Solar PV cell? **[7]**

P.T.O.

Q7) a) Write a short note on biomass energy conversion to Electricity. **[6]**

b) Explain fuel cell with neat sketch. **[7]**

OR

Q8) a) Write a short note on stand alone renewable system with diagram. **[6]**

b) Explain Biomass energy conversion with neat sketch. **[7]**



Total No. of Questions : 8]

SEAT No. :

P9396

[Total No. of Pages : 2

[6179]-21
S.E. (Electrical)
ANALOG & DIGITAL ELECTRONICS
(2015 Pattern) (Semester - I) (203143)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of non-programmable calculator is permitted.***
5) ***Assume suitable data, if necessary.***

Q1) a) Convert: **[6]**

i) $(754)_8 = (?)_2$

ii) $(2F9A)_{16} - (?)_2$

iii) $(A72E)_{16} = (?)_8$

b) Explain the operation of JK flip flop with truth table. What is race around condition for it? **[6]**

OR

Q2) a) i) Perform the following addition in BCD: $(36)_{10}$ with $(95)_{10}$ **[6]**

ii) use K – map to minimize the following standard POS expression:

$(A+ B + C)\ (A + B + \overline{C})\ (A + \overline{B} + C)\ (A+ \overline{B} + \overline{C})\ (\overline{A} + \overline{B} + \overline{C})$

b) Explain ring counter with neat diagram. Also draw the timing diagram. **[6]**

Q3) a) Draw and explain frequency response characteristics of ideal and practical low pass filter. **[7]**

b) Explain the working of OPAMP as Schmitt trigger. Also draw the waveforms. **[6]**

OR

Q4) a) Explain the application of OPAMP as square wave generator. **[7]**

b) Explain working of IC 555 as astable multivibrator. **[6]**

P.T.O.

Q5) a) Explain Darlington connection and explain how it improves the current gain. **[6]**

b) Explain the characteristics of JFET. **[6]**

OR

Q6) a) Write a short note on transformer coupled two stage amplifier. Give its advantages and disadvantages. **[6]**

b) Write a short note on push pull amplifier. Draw the waveforms. **[6]**

Q7) a) Explain the construction and working of three phase full wave bridge rectifier connected to R-load with neat diagram. **[7]**

b) Compare single phase half wave and full wave rectifier. **[6]**

OR

Q8) a) Explain the working of full wave precision rectifier with neat diagrams. **[7]**

b) A 230 V, 50 Hz ac voltage is applied to the primary of 4:1 step down transformer which is used in bridge rectifier, having a load resistance of 200 Ohm. Assuming the diodes to be ideal, find: **[6]**

i) D.C. output voltage

ii) peak inverses voltage

iii) output frequency



Total No. of Questions : 8]

SEAT No. : ____

P9397

[Total No. of Pages : 2

[6179]-22
S.E. (Electrical)
MATERIAL SCIENCE
(2015 Pattern) (Semester - I) (203142)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Physical Constants:

1. Angstrom Unit(AU) = 1×10^{-10} metres
2. Boltzmann's Constant (k) = 1.380×10^{-23} joule.degree -1
3. Charge on Electron (e) = 1.601×10^{-19} coulomb
4. Mass of Electron (m) = 9.107×10^{-31} kg
5. Electron volt (eV) = 1.602×10^{-19} joules
6. Mass of Proton (m_p) = 1.627×10^{-27} kg
7. Velocity of light (c) = 2.998×10^{8} m/sec
8. Dielectric Constant of free space (ε_0) = 8.854×10^{-12} F/m
9. Permeability of free space (μ_0) = $4\pi \times 10^{-7}$ H/m
10. Debye Unit = 3.33×10^{-30} coulomb. metre

Q1) a) Define following with their units : **[6]**

i) Polarization

ii) Polarizability

iii) Susceptibility

b) Derive Clausious Mossotti equation & state its assumptions. **[6]**

OR

Q2) a) Illustrate with diagram electrostriction & piezoelectric effect with its applications. **[6]**

b) Explain following terms with units: **[6]**

i) Loss tangent

ii) Ferro electricity

iii) Pyro electricity

P.T.O.

Q3) a) Write short notes on Ferrites with their properties and applications. **[6]**

b) Describe properties and application of high resistive material and list 5 high resistive material. **[6]**

OR

Q4) a) What do you mean by an alloy? Write properties of kanthal and manganin. **[6]**

b) In a material an application of magnetic field of 1.75×10^5 ampere per meter causes a magnetic flux density of 218.2 mili weber/meter^2. Calculate its permeability and susceptibility. Also find magnetization. **[6]**

Q5) a) Describe with neat diagram. **[7]**

i) Carbon clusters

ii) Nano wires

b) Describe briefly, energy bands in conductors and insulators. **[6]**

OR

Q6) a) Explain with neat diagram - Single Electron Transistor. **[6]**

b) Explain with neat diagram chemical reaction and applications of Sodium sulphur battery **[7]**

Q7) a) Explain the method of finding dielectric strength of solid insulating material with a neat diagram as per IS 2584. **[7]**

b) With neat diagram explain how flux density is measured with the help of gauss meter. **[6]**

OR

Q8) a) Explain the method of finding dielectric strength of air using sphere gap voltmeter with a neat diagram as per IS. **[7]**

b) Enlist the apparatus along with the specification. **[6]**

Total No. of Questions : 8]

SEAT No. :

P9398

[Total No. of Pages : 2

[6179]-23
S.E.(Electrical)
ELECTRICAL MEASUREMENTS & INSTRUMENTATION
(2015 Pattern) (Semester - I) (203144)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q.5 or Q.6, Q.7 or Q. 8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figure to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Define the following terms. **[6]**

i) Accuracy.

ii) Reproducibility

iii) Linearity

b) Classify resistance hence give examples of each type. **[6]**

OR

Q2) a) Draw neat diagram and explain construction and working of PMMC instrument. **[6]**

b) Derive general bridge balance equation of AC bridge. **[6]**

Q3) a) In an experiment for measurement of power by two wattmeter method for a load of 415V, 20A, one wattermeter reads 100 kW and other reads 80 kW. Calculate power factor of the load, total active and reactive power consumed. **[7]**

b) Draw neat diagram of electronic energy meter and explain its working. **[6]**

OR

Q4) a) Explain how one wattemeter method with two way switch arrangement can be used for measurement of power in the 3 phase circuit. **[6]**

b) A 230 V, 50 Hz, 1 phase energy meter has a constant of 200 rev/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 meter? **[7]**

P.T.O.

Q5) a) What is transducer, give detailed classification of transducer. **[6]**

b) Explain various front panel controls of CRO. **[6]**

OR

Q6) a) With neat diagram, Explain Pirani gauge for low pressure measurement. **[6]**

b) State importance of pressure measurement hence give detailed classification of pressure. **[6]**

Q7) a) With neat diagram explain pneumatic method for level measurement. **[6]**

b) Explain construction and working of bonded and unbonded strain gauge. **[7]**

OR

Q8) a) With neat diagram, explain construction and working of RVDT. **[7]**

b) With neat diagram explain ultrasonic method for level measurement. **[6]**

Total No. of Questions : 8]

SEAT No. : ____

P9399

[Total No. of Pages : 2

[6179]-24

S.E. (Electrical)

ELECTRICAL MACHINES - I

(2015 Pattern) (Semester - II) (203146)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***

Q1) a) Develop equivalent circuit of transformer in steps. Mark all parameters in it. Clearly state assumptions made. **[6]**

b) With suitable diagram, describe parallel operation of single phase transformers. Write the expression of kVA shared by the two transformers. **[6]**

OR

Q2) a) A single phase 50kVA, 2400/120 volt transformer gave following test results.

Open circuit test (meters connected on LV side)

120 volt, 9.85 Amp, 396 watt.

Short circuit test (Meters connected on HV side)

92 volt, 20.8 Amp, 810 watt

Determine - Equivalant circuit parameters, efficiency at full load 0.8 power factor lag. **[6]**

b) Explain scott connection of transformer with suitable circuit diagram and phasor diagram. **[6]**

Q3) a) A 500 volt DC shunt motor has armature resistance of 1.5 Ohm and field resistance of 400 Ohm. At No Load condition it takes 5 Amp from supply and runs at 1000 rpm. Determine the speed when the motor when it draws 30 Amp from supply. Also find speed at this load if shunt field current is reduced by 15%. **[7]**

b) Explain process of commutation in DC machine. **[6]**

OR

P.T.O.

Q4) a) Draw a neat sketch of DC machine. Label all parts. State - function of each part & material used for respective part. **[7]**

b) State any 3 applications of DC series motor and DC shunt motor. **[6]**

Q5) a) Draw a neat sketch of star - delta starter used for 3 phase induction motor. Explain its working. **[6]**

b) Draw and explain Torque - slip characteristics of 3 phase induction motor. Clearly mark starting torque, maximum torque points in it. **[7]**

OR

Q6) a) A 500 volt 3 phase, 50 Hz, induction motor develops output of 15 kW at 950 rpm with power factor 0.86 lagging. The mechanical losses are 730 watt and stator losses are 1500 watt. Find - slip, rotor copper loss, motor input, current drawn by motor. **[6]**

b) Draw circle diagram of 3 phase induction motor. Mark all parameters in it. How to find maximum output from circle diagram. **[7]**

Q7) a) Develope approximate equivalant circuit of 3 phase induction motor in steps. **[6]**

b) Derive the condition for maximum torque under running condition for 3 phase induction motor. **[6]**

OR

Q8) a) Compare 3 phase squirrel cage induction motor with slipring induction motor. **[6]**

b) With the help of circuit diagram explain no load and blocked rotor test on 3 phase induction motor. Write down the calculations involved. **[6]**

Total No. of Questions : 8]

SEAT No. : ____

P9400

[Total No. of Pages : 2

[6179]-25

S.E. (Electrical)

POWER SYSTEM-I

(2015 Pattern) (Semester-II) (203145)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Define the following terms associated with load characteristics. **[6]**

i) Demand factor

ii) Load factor

iii) Diversity factor.

b) Each conductor of a 3-phase overhead transmission line is suspended from a cross arm of a steel tower by a string of 4 suspension insulators. The voltage across the second unit is 15 kV & across the third 27 kV. Find the voltage between conductors & string efficiency. **[6]**

OR

Q2) a) Explain the function and field of use of following equipments used in power plant **[6]**

i) Bus bars

ii) Isolators

b) Define tariff hence explain desirable characteristics of tariff. **[6]**

Q3) a) Derive the expression for sag when supports are at equal level. **[7]**

b) Determine the loop inductance per km of a single phase transmission line comprising of two parallel conductors each 5 mm in diameter and 1.5 m apart. **[6]**

OR

P.T.O.

Q4) a) Derive an expression for the inductance of a 3 phase overhead transmission line with symmetrical spacing assuming the line is transposed. **[6]**

b) A transmission line conductor at river crossing is supported from two towers at heights 70m and 65 m above water level. The horizontal distance between the towers is 160m. If maximum allowable strength in the conductor is 800 kg with safety factor of 2. Find distance of lowest point on conductor above the water level. Weight of conductor is 0.35 kg/m. **[7]**

Q5) a) A 3-phase, 50 Hz, 132 kV overhead line has conductors placed in a horizontal plane 3.5 m apart. Conductor diameter is 1.8 cm. If the line length is 95 km, calculate the charging current per phase assuming complete transposition. **[6]**

b) What is the method of images? How it can be used to take into account the presence of ground in calculating the capacitance of a single phase line? **[6]**

OR

Q6) a) Derive an expression for capacitance per phase of a single phase overhead transmisssion line. **[6]**

b) A single phase line is having two single stranded conductors & radius of 0.298 cm. the conductors are spaced 3.5 m apart. Calculate the capacitance to neutral/km. neglect the effect of earth. **[6]**

Q7) a) Classify transmission lines based on length and voltage levels. **[6]**

b) Draw neat representations of short line, medium line nominal 'Pi' model and Nominal 'T' model. **[7]**

OR

Q8) a) Explain in brief-Ferranti effect. **[7]**

b) An overhead 3-phase short transmission line delivers 4.5 MW at 22kV with 0.78 p.f. lagging at receiving end. The resistance & reactance of each conductor is 5 Ω & 6 Ω respectively. Determine : Sending end voltage. **[6]**

❖ ❖ ❖

Total No. of Questions : 8]

SEAT No. :

P9401

[Total No. of Pages : 3

[6179]-26

S.E. (Electrical Engineering)

NUMERICAL METHODS AND COMPUTER PROGRAMMING

(2015 Pattern) (Semester - II) (203148)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***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.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is the meaning of entry control and exit control loop used in 'C' programming? Write the syntax from any one of the commands from the entry and exit control loop along with its one example. **[6]**

b) if $u = \dfrac{4x^2y^3}{z^4}$ **[6]**

And errors in x, y, z be 0.001, compute the relative maximum error in u when $x = y = z = 1$.

OR

Q2) a) Write a short note on: **[6]**

i) One-dimensional array with their example.

ii) Two-dimensional arrays with their example.

b) Using the Birge Vieta method, find the real root of the equation: **[6]**

$x^3 + 2x^2 - 5x - 6 = 0$

Perform Two Iterations. Take $P_0 = 1.3$.

Q3) a) Use Sterling's interpolation formula and hence find the value of y when $x = 12$ **[6]**

x	5	10	15	20	25
$y = f(x)$	32	29	24	19	17

b) Fit a second-degree parabola to the following data:

x	10	12	15	23	20
y	14	17	23	25	21

[7]

OR

P.T.O.

Q4) a) Derive the formula for Newton's divided difference for the interpolation when the data is unequally spaced. **[6]**

b) Find the negative root of $x^3 - \sin(x) + 1 = 0$ correct to three decimal places using Newton-Raphson method. Take $x_0 = -2$ **[7]**

Q5) a) Evaluate the integral using the Simpson's 1/3rd rule. Take $h = k = \frac{\pi}{4}$ **[7]**

$$z = \int_0^{\pi/2} \int_{\pi/2}^{\pi} \cos(x+y)\, dxdy$$

b) Solve the following ordinary differential equation by using Runge-Kutta fourth-order method. Take initial approximation as $y(0) = 1$. Find the value of y when $x = 0.2$. **[6]**

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

OR

Q6) a) Use Euler's method to solve the following ordinary differential equation and hence find the value of $y(1.2)$ taking the step size as $h = 0.4$. **[7]**

$$\frac{dy}{dx} = x + 2y$$

$$y(0) = 1$$

b) Use the Simpson's 1/3rd with step size as h = 0.5 to estimate the following integral. **[6]**

$$I = \int_1^2 \frac{1}{x^2}\, dx$$

Q7) a) Use the Seidel method to solve the following set of equations. Consider the initial approximation as $x^{(0)} = y^{(0)} = z^{(0)} = 0$. Solve only 5 iterations. **[6]**

$10x + 2y + z = 10$

$2x + 10y - 2z = -33$

$-2x + 3y + 10z = 15$

b) Apply Gauss Elimination Method to solve the following set of equations. **[6]**

$x - 4y + z = -5$

$x + y + 6z = -8$

$3x - y - z = 4$

OR

Q8) a) Apply the Gauss-Jordan method to solve the following equations: **[6]**

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

$$2x + 3y - 4z = 10$$

$$3x + 4y + 5z = 35$$

b) Use the Gauss-Jordan method to find the inverse of the following matrix. **[6]**

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

Total No. of Questions : 8]

SEAT No. : ____

P9402

[Total No. of Pages : 2

[6179]-27
S.E. (Electrical)
FUNDAMENTALS OF MICROCONTROLLER AND ITS APPLICATIONS
(2015 Pattern) (Semester - II) (203149)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Use suitable data.***

Q1) a) Write short note on comparison of Microprocessor & Microcontroller. **[6]**

b) Explain the stack organization and enlist instructions related to stack. Where is the stack pointer initialized at power ON? **[6]**

OR

Q2) a) Explain the instructions : **[6]**

i) MOVX A, @DPTR

ii) CJNE A, # data, rel

iii) MUL AB

b) Explain the addressing modes of 8051 Microcontroller with examples. **[6]**

Q3) a) Write a program to clear 10 RAM locations starting at RAM address 20H. **[6]**

b) Draw & explain SCON register. **[7]**

OR

Q4) a) Write a program to create a square wave of 60% duty cycle on Port 1 bit 0. **[6]**

b) Write note on interrupt structure of 8051. What are the steps taken by 8051 in response to an interrupt? **[7]**

P.T.O.

Q5) a) Draw and Explain Block Diagram of 8255 PPI. **[6]**

b) Interface DAC 0808 with 8051 Microcontroller. Write a program to generate triangular waveform. **[6]**

OR

Q6) a) Explain with diagram, 8255 Mode 1 Input mode and the handshake signals used. **[6]**

b) Explain the use of BSR mode of 8255. Write a program to set PC_4 and PC_0 and reset it after some time. **[6]**

Q7) a) With the help of block diagram, show how power can be measured using 8051. **[6]**

b) Draw an interfacing diagram and write program for control of a relay by using 8051. **[7]**

OR

Q8) a) With the help of block diagram explain Flow measurement using 8051. **[6]**

b) Draw an interfacing diagram and write program for speed control of a stepper motor using 8051. **[7]**

Total No. of Questions : 8]

SEAT No. :

P9403

[Total No. of Pages : 3

[6179]-28

S.E. (Electronics/E & TC)

SIGNAL S AND SYSTEMS

(2015 Pattern) (Semester - I) (204181)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***

Q1) a) Write expression for energy and power of the signal. Also determine whether the signal $x(t) = (5 \cos \pi t + \sin 5 \pi t)$ is energy or power and find its energy or time averaged power. **[6]**

b) For an LTI system with unit impulse response $h(t) = e^{-2t} u(t)$, determine the output to the input $x(t) = e^{-t} u(t)$. **[6]**

OR

Q2) a) Check whether the following systems are causal, time variant and linear and justify. **[6]**

i) $x^2(t) + x(t+2)$

ii) $A\, x[n] + B$

b) Determine the convolution sum of two sequences graphically, $x[n] = \{1, 2, 3, 2\}$ $h[n] = \{1, 2, 2\}$. **[6]**

Q3) a) Find Fourier transform of following signals using appropriate properties : **[6]**

i) $x(t) = \dfrac{d}{dt}\left(e^{-at}u(t)\right)$

ii) $x(t) = e^{-2t} u(t+2)$

b) Draw the magnitude and phase spectrum of the signal $x(t) = 5 \cos (2\pi\, 10t + 30) - 10 \cos (2\pi\, 20t + 60)$. **[6]**

OR

P.T.O.

Q4) a) Find trigono metric Fourier series of the signal shown in Figure 1. **[6]**

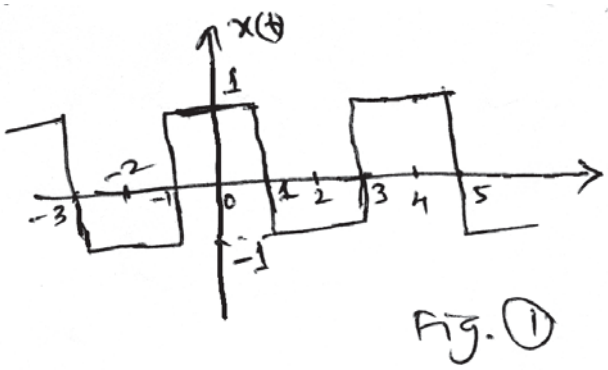


Fig. ①

b) Obtain the Fourier transform of following functions **[6]**

i) $x(t) = u(t)$

ii) $x(t) = 1$

iii) $x(t) = \text{sgn}(t)$

Q5) a) Find laplace transform of $x(t) = e^{-2t}\left[u(t) - u(t-5)\right]$ and its ROC. **[7]**

b) Find inverse laplace transform of $x(s) = \dfrac{2}{(s+4)(s-1)}$ if region of convergence is **[6]**

i) $-4 \le \text{Re}(s) < 1$

ii) $\text{Re}(s) > 1$

iii) $\text{Re(s)} < -4$

OR

Q6) a) Given the laplace transform of $x(t)$ as $x(s) = \dfrac{2s}{s^2+2}$ where $x(t) = 0$ for $t < 0$. Determine the laplace transform of $x(3t)$ and $x(t-2)$. **[6]**

b) Find initial and final value of $x(s) = \dfrac{5s+50}{s(s+5)}$. **[7]**

Q7) a) A coin is tossed 3 times. Write the sample space which gives all possible outcomes. A random variable X represents the number of heads on any triple toss. Calculate and draw the CDF and PDF. **[7]**

b) State and prove any three properties of PDF. **[6]**

OR

Q8) a) The probability density function of a random variable X is given by :**[7]**

$$f_x(x) = \begin{cases} \frac{1}{a} & |x| \le a \\ 0 & \text{else where} \end{cases}$$

Determine :

i) mean E(x)

ii) mean square value E(x^2)

iii) standard deviation

b) State and explain the properties of auto correlation function for energy signal. **[6]**

Total No. of Questions : 8]

SEAT No. :

P9404

[Total No. of Pages :2

[6179]-29
S.E. (E&TC and Electronics)
ELECTRICAL CIRCUITS & MACHINES
(2015 Pattern) (Semester-I) (204183)

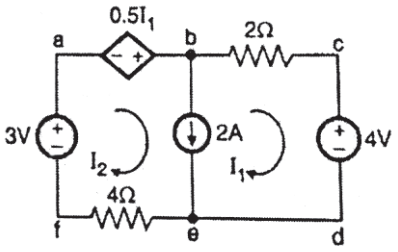
Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicates full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of non-programmable electronic pocket calculator is allowed.***

Q1) a) Explain construction and working of Potential Transformer. **[5]**

b) Using Kirchhoff's laws, determine I_1 in the circuit shown. **[7]**



OR

Q2) a) State and Explain Maximum power transfer theorem. **[5]**

b) Describe the various losses in transformer. **[7]**

Q3) a) Sketch and explain D.C. series motor characteristics. **[6]**

b) Explain working principle of synchronous motor. **[7]**

OR

Q4) a) Compare Squirrel Cage type and phase wound type rotor construction of 3-Phase induction motor. **[6]**

b) Explain the effect of rotor resistance on its characteristics with diagram **[7]**

P.T.O.

Q5) a) State applications of: **[6]**

i) BL D.C. motor

ii) Reluctance motor

iii) Universal motor.

b) What is a Brushless D.C. motor? Explain working and construction of any one type of BL D.C. motor. **[6]**

OR

Q6) a) Distinguish between Brushless DC motor and Conventional DC Motor. **[6]**

b) Explain construction and working of Reluctance motor. Sketch its Torque-Speed Characteristic. **[6]**

Q7) a) Explain the working and features of armature controlled d.c. servomotor. **[7]**

b) What is stepper motor? Explain any one type of stepper motor. **[6]**

OR

Q8) a) Explain construction and working of single-phase shaded pole induction motor and State its applications. **[7]**

b) Write a short note on servomotor. **[6]**



Total No. of Questions : 8] **SEAT No. :**

P9686 **[Total No. of Pages : 2**

[6179]-30A
S.E. (E & TC/Electronics)
DATA STRUCTURES & ALGORITHMS
(2015 Pattern) (Semester - I) (204184)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Illustrate the parameters with suitable example: call by value & call by reference. **[6]**

b) Sort the following numbers using bubble sort. Show all steps & discuss time complexity. **[6]**

20 15 14 5 18 6

OR

Q2) a) What is recursive function? Write a program to find factorial of a number. **[6]**

b) What is binary search? Explain with suitable example. **[6]**

Q3) a) What is Stack? Write push & pop functions in C to implement stack in an array. **[7]**

b) What are the differences between Static Memory allocation & Dynamic Memory allocation? **[6]**

OR

Q4) a) Define Queue? Explain Circular queue and Priority queue with suitable example. **[7]**

b) What is doubly linked list? Write pseudo code to delete a node from DLL. **[6]**

Q5) a) Define following terminologies: **[6]**

i) Complete binary tree
ii) Siblings
iii) Non terminal nodes
iv) Forest
v) Root node/root
vi) Height/Depth of tree

P.T.O.

b) Write inorder, preorder &postorder traversals for the following tree. **[6]**

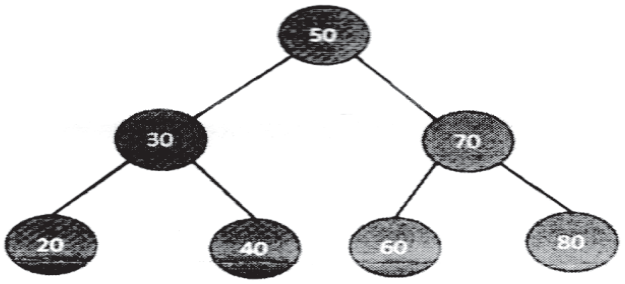


Fig. No : 1

OR

Q6) a) Write a C function to insert a node in a Binary Search Tree. **[6]**

b) Construct BST for the following data and write inorder. preorder and postorder traversals for the constructed tree. **[6]**

100, 400, 40, 30, 50, 5000, 300.

Q7) a) Define the term graph. With the help of suitable example give adjacency matrix & adjacency list representation for the same. **[7]**

b) Construct minimum spanning tree using prim's algorithm, consider A as starting vertex. **[6]**

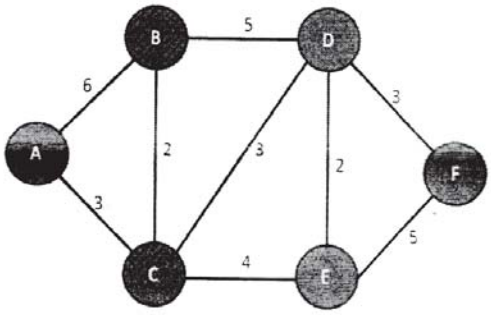


Fig. No : 2

OR

Q8) a) Define the term spanning tree. What is minimum spanning tree? Explain Kruskal's algorithm to find minimum spanning tree with suitable example. **[7]**

b) Explain Dijktra's Shortest Path Algorithm with suitable example. **[6]**

Total No. of Questions : 8]

SEAT No. : ____

P-9406

[Total No. of Pages : 2

[6179]-31
S.E. (E & TC) (Electronics)
DIGITAL ELECTRONICS
(2015 Pattern) (Semester - I) (204185)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates :

1) ***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.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Define Adders and give their types with proper details. **[4]**

b) Explain D Flip flop with neat Block diagram, truth table. **[4]**

c) Compare Multiplexer and De-multiplexer. **[4]**

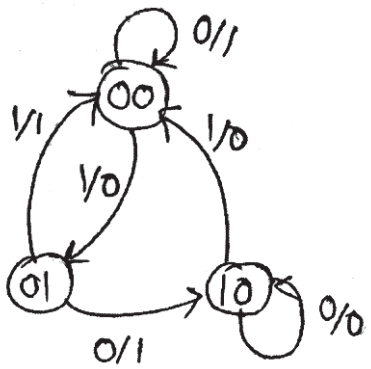
OR

Q2) a) Definitions of SOP and POS terms. **[2]**

b) Design 3-bit binary to gray code converter. **[5]**

c) Convert SR flip flop to D flip flop. **[5]**

Q3) a) Design the sequential circuit for the given state diagram using D flip flop. **[6]**



b) Explain with neat diagram 2 input CMOS NAND gate. **[6]**

P.T.O.

OR

Q4) a) Explain the following characteristics of digital IC's. **[6]**

i) Fan in

ii) Noise margin

iii) Propagation delay

b) Write short note on state reduction with suitable example. **[6]**

Q5) a) Explain the block diagram of memory unit? **[7]**

b) Illustrate the features of a ROM cell. **[6]**

OR

Q6) a) Design and implement Full Adder using PAL? **[7]**

b) Explain CPLD architecture. **[6]**

Q7) a) List the features of 8051 microcontroller. **[5]**

b) Draw and explain block diagram of 8051 in detail. **[5]**

c) Explain following instructions of 8051. **[3]**

i) ADD A, B

ii) MUL AB

iii) SJMP

OR

Q8) a) Write short note on internal memory organization of 8051. **[5]**

b) Draw and Explain PSW register of 8051 in detail. **[5]**

c) Explain following pins of 8051. **[3]**

i) ALE

ii) RST

iii) PSEN

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

P9407

[Total No. of Pages : 4

[6179]-32
S.E. (Electronics/E & TC)
ENGINEERING MATHEMATICS-III
(2015 Pattern) (Semester-II) (207005)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Use of logrithmic tables slide rule, Mollier charts, electronic pocket claculator Steam table is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Solve any two of the following. **[8]**

i) $(D^2 + 2D + 1)\, y = xe^{-x} \cos x$

ii) $\dfrac{d^2y}{dx^2} + y = \cos ec\, x$

(by method of variation of parameters)

iii) $\dfrac{dx}{3z-4y} = \dfrac{dy}{4x-2z} = \dfrac{dz}{2y-3x}$

b) Using inverse cosine transform, find $f(x)$ if $F_c(\lambda) = \overline{e}^{\lambda}; \lambda > 0$ **[4]**

OR

Q2) a) An uncharged condenser of capacity C Charged by applying an e.m.f. of value $E\sin\dfrac{t}{\sqrt{LC}}$ through the leads of inductance L and negligible resistance. The charge Q on the plate of condenser satisfies the differential equation: $\dfrac{d^2Q}{dt^2} + \dfrac{Q}{LC} = \dfrac{E}{L}\sin\dfrac{t}{\sqrt{LC}}$.

Prove that the charge at any time t is given by :

$$Q = \frac{EC}{2}\left[\sin\frac{t}{\sqrt{LC}} - \frac{t}{\sqrt{LC}}\cos\frac{t}{\sqrt{LC}}\right].$$ **[4]**

P.T.O.

b) Find inverse z-transform (any one): **[4]**

i) $F(z) = \dfrac{z}{\left(z-\frac{1}{4}\right)\left(z-\frac{1}{5}\right)}$; $|z| > \dfrac{1}{4}$.

ii) $F(z) = \dfrac{10z}{(z-1)(z-2)}$ (by inversion integral method)

c) Solve the difference equation:
$f(k+1) - f(k) = 1, k \geq 0, f(0) = 0.$ **[4]**

Q3) a) Solve the differential equation $\dfrac{dy}{dx} = 1 + xy,\ y(0) = 2$ to get $y(0.2)$ taking $h = 0.2$ by using Runge-Kutta method of fourth order. **[4]**

b) Find Lagrange's interpolating polynomial passing through the set of points: **[4]**

x	0	1	2
y	4	3	6

Use it to find y at $x = 1.5$ and $\dfrac{dy}{dx}$ at $x = 0.5$.

c) If the directional derivative of $\phi = axy + byz + czx$ at (1, 1, 1) has maximum magnitude 4 in a direction parallel to x – axis, find the values of a, b, c. **[4]**

OR

Q4) a) Show that (any one): **[4]**

i) $\nabla^4(r^4) = 120$

ii) $\nabla \cdot \left(r \nabla \dfrac{1}{r^5}\right) = \dfrac{15}{r^6}$

b) Show that the vector field $\bar{F} = (x^2 - yz)\bar{i} + (y^2 - zx)\bar{j} + (z^2 - xy)\bar{k}$ is irrotational. Also Find scalar potential ϕ such that $\bar{F} = \nabla\phi$. **[4]**

c) Evaluate $\int_0^3 \dfrac{dx}{1+x}$ by dividing the interval into 6 equal parts and using the Simpson's $\dfrac{3^{th}}{8}$ rule. **[4]**

Q5) a) A vector field is given by $\bar{F} = \sin y\,\bar{i} + x(1+\cos y)\bar{j}$, evaluate the integral $\int_c \bar{F} \cdot d\bar{r}$ where C is the circle $x^2 + y^2 = 4$, $z = 0$. **[4]**

b) Using Gauss- Divergence theorem prove that

$$\iint_S (\phi\nabla\psi - \psi\nabla\phi)\cdot d\bar{S} = \iiint_V (\phi\nabla^2\psi - \psi\nabla^2\phi)\, dV.$$ **[4]**

c) Using Stoke's theorem evaluate $\iint_S (\nabla \times \bar{F}).d\bar{S}$

where $\bar{F} = (x^3 - y^3)\bar{i} - xyz\,\bar{j} + y^3\,\bar{k}$ and S is surface $x^2 + 4y^2 + z^2 - 2x = 4$ above the plane $x = 0$ **[5]**

OR

Q6) a) Evaluate $\int_C \bar{F} \cdot d\bar{r}$, where $\bar{F} = 3y\,\bar{i} + 2x\,\bar{j}$ and C is the boundary of the region $0 \le x \le \pi$, $0 \le y \le \sin x$. **[4]**

b) Using Gauss Divergence theorem show that $\iint_S \bar{F} \cdot d\bar{S} = 6V$ where $\bar{F} = \nabla r^2$ and S is any closed surface containing volume V. **[4]**

c) Evaluate $\iint_S (\nabla \times \bar{F}) \cdot d\bar{S}$ where S is surface of paraboloid $x^2 + y^2 = 2z$ bounded by plane z=2 and $\bar{F} = 3(x-y)\bar{i} + 2xz\,\bar{j} + xy\,\bar{k}$. **[5]**

Q7) a) If $f(z) = u + i$ V is an analytic function,

show that $\left(\frac{\partial^2}{\partial x^2} + \frac{d^2}{\partial y^2}\right)|f(z)|^2 = 4\,|f'(z)|^2$. **[4]**

b) Evaluate: $\oint_C \frac{z^2+1}{z-3}dz$ where C is the circle $|z-3| = 2$. **[4]**

c) Find he bilinear transformation which maps the points $z = -1, 0, 1$ on to the points $w = 0, i, 3i$ respectively. **[5]**

OR

Q8) a) Show that the analytic function $f(z) = u + iv$ with constant modulus is constant. **[4]**

b) Evaluate : $\oint_C \frac{(z^2 + \cos^2 z)}{\left(z - \frac{\pi}{4}\right)^3} dz$, where C is the circle $|z| = 1$. **[4]**

c) Find the image of X-axis under the transformation $w = \frac{i - z}{i + z}$. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

P9408

[Total No. of Pages : 3

[6179]-33

S.E. (Mechanical/Automobile)/(Mechanical/Sandwich)

ENGINEERING MATHEMATICS - III

(2015 Pattern) (Semester - I) (207002)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Black figures to the right indicate full marks.***
4) ***Use electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Solve any two of the following : **[8]**

i) $(D^2 + 2D + 1)\, y = x\, e^{-x} \cos x$

ii) $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + 16y = x^2 + 2^{\log x} + 4\cosh(\log x)$

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

b) Using suitable Fourier transform, solve the following equation **[4]**

$$\int_0^\infty f(x)\sin\lambda x dx = \begin{cases} 1-\lambda & 0 \le \lambda \le 1 \\ 0 & \lambda \ge 1 \end{cases}$$

OR

Q2) a) A body of weight 9.8N is suspended from a spring having constant 4N/m. Prove that the motion is one of the resonance if a force 16 sin2t is applied and damping force is negligible. Assume that initially the weight is at rest in the equilibrium position. **[4]**

b) Solve any two **[8]**

i) Evaluate the integral $\int_0^\infty e^{-4t}\cos t\, dt$, by using concept of laplace transform.

ii) Obtain $L^{-1}\left[\frac{s+1}{(2s-1)(s+2)}\right]$.

iii) Using laplace transform solve the DE $y'' + 2y' + y = te^{-t}$, $y(0) = 1$, $y'(0) = -2$.

P.T.O.

Q3) a) The first four moments of a distribution about the value 5 are 2, 20, 40 & 50. From the given information about first four central moments and coefficients of skewness & kurtosis. **[4]**

b) In a certain factory turning out razor blades, there is a small chance of $\frac{1}{500}$ for any blade to be defective. The blades are supplied in a pocket of 10. Use poisson distribution to calculate the approximate number of packets containing : **[4]**

i) no defective blades in a consignment

ii) two defective blades in a consignment of 10000 packets.

c) Find directional derivative of $\phi = xy^2 + yz^2 + zx^2$ at (1, 1, 1) along the vector $\bar{i} + 2\bar{j} + 2\bar{k}$. **[4]**

OR

Q4) a) Obtain correlation coefficient between population density (per square miles) and death rate (per thousand persons) from data related to 5 cities. **[4]**

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

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

i) For a constant vector $\bar{a}$ show that $\nabla(\bar{a} \cdot \bar{r}) = \bar{a}$

ii) Prove that $\nabla(\bar{r} \cdot \bar{u}) = \bar{r} \times (\nabla \times \bar{u}) + (\bar{r} \cdot \bar{v})\bar{u} + \bar{u}$

c) Show that the vector field $\bar{F} = (2xz^3 + 6y)\bar{i} + (6x - 2yz)\bar{j} + (3x^2z^2 - y^2)\bar{k}$ is irrotational and hence find scalar function ϕ such that $\bar{F} = \nabla\phi$. **[4]**

Q5) a) Evaluate $\int_C \bar{F} \cdot d\bar{r}$ for $\bar{F} = 3x^2\bar{i} + (2xz - y)\bar{j} + z\bar{k}$ along the curve $x = 2t^2$, $y = t$, $z = 4t^2 - t$ from $t = 0$ to $t = 1$. **[5]**

b) Evaluate $\iint_S (x^3\bar{i} + y^3\bar{j} + z^3\bar{k}) \cdot d\bar{s}$ where S is the surface of the sphere $x^2 + y^2 + z^2 = 16$. **[4]**

c) Evaluate $\iint_S (\nabla \times \bar{F}) \cdot d\bar{s}$. Where $\bar{F} = (x^3 - y^3)\bar{i} - xyz\bar{j} + y^3\bar{k}$ and S is the surface $x^2 + 4y^2 + z^2 - 2x = 4$ above the plane $x = 0$. **[4]**

OR

Q6) a) Using Green's theorem evaluate $\int_C [(\cos x \sin y - 4y)dx + [\sin x \cos y\, dy]]$ where C is the circle $x^2 + y^2 = 1$. **[4]**

b) Evaluate $\iint_S \bar{F} \cdot d\bar{s}$ where $\bar{F} = yz\,\bar{i} + zx\,\bar{j} + xy\,\bar{k}$ and S is the upper part of the sphere $x^2 + y^2 + z^2 = 1$. **[4]**

c) Evaluate $\iint_S (\nabla \times \bar{F}) \cdot \hat{n} ds$ where $\bar{F} = x y^2\,\bar{i} + y\,\bar{j} + z^2 x\,\bar{k}$ and S is the surface of a rectangular lamina bounded by $x = 0, y = 0, x = 1, y = z, z = 0$. **[5]**

Q7) a) Solve the equation $\frac{\partial^2 u}{\partial t^2} = C^2 \frac{\partial^2 u}{\partial x^2}$ under conditions : **[7]**

i) $u(0, t) = 0$
ii) $u(\pi, t) = 0$
iii) $\frac{\partial u}{\partial t} = 0$ when $t = 0$
iv) $u(x, 0) = 2$ $0 < x < \pi$

b) Solve $\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}$ if **[6]**

i) $u(0, t) = 0$
ii) $u_x(1, t) = 0$
iii) $u(x, t)$ is bounded
iv) $u(x,0) = \frac{2x}{l}$ $0 \le x \le l$.

OR

Q8) a) Solve the laplace eq^n $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to condition : **[6]**

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 the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial t^2}$ $0 < x < \infty$, $t > 0$ subject to conditions : **[7]**

i) $u(0, t) = 0$ $t > 0$
ii) $u(x,0) = \begin{cases} 6 & 0 < x < 1 \\ 0 & x > 1 \end{cases}$
iii) $u(x, t)$ is bounded

Total No. of Questions : 8]

SEAT No. : ____

P9409

[Total No. of Pages : 3

[6179]-34

S.E. (Mechanical/Automobile/Sandwich)
THERMODYNAMICS
(2015 Pattern) (Semester-I) (202043)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Solve 4 questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Answer for the four questions should be written in same answer book attach supplement if required.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of steam tables, Psychrometric chart, Mollier Charts, scientific calculator is allowed.***
6) ***Assume Suitable data, if necessary.***

Q1) a) Define State, Path, Process, Cycle, Boundary and Isolated system. **[6]**

b) One kg ideal gas is heated from 18.3ºC to 93.4ºC. Assuming gas constant as 0.264 kJ/kgK and adiabatic index as 1.18, Fide **[6]**

i) Specific heats,

ii) Change in IE and

iii) Change in enthalpy

OR

Q2) a) Explain Entropy as a property of the system. **[6]**

b) System undergoes a cyclic process composed of four processes 1-2, 2-3, 3-4, & 4-1 Energy transfer is tabulated below complete table and determine power output. **[6]**

Process	Q kJ/min	W kJ/min	
1-2	400	150	--
2-3	200	--	300
3-4	-200	--	--
4-1	0	75	--

P.T.O.

Q3) a) Compare Otto and Diesel cycle on the basis of **[6]**

i) Fuel used

ii) Compression ratio

iii) Thermal efficiency

b) Explain Helmholtz and Gibbs function. **[6]**

OR

Q4) a) Define dryness fraction and explain any one steam calorimeter with a neat sketch. **[6]**

b) Show the simple saturated vapour compression refrigeration cycle on p-h and T-s diagram. **[6]**

Q5) a) Give the function and location of the following: **[6]**

i) Superheater

ii) Fusible plug

iii) Water level indicator

b) Define Equivalent evaporation and Draw block diagram of a boiler plant showing location of air preheater, super heater, economizer clearly indicating the air and water circuit flow. **[7]**

OR

Q6) a) The following data refers to steam power plant: Height of chimney-30m, Draught produced-16.5 mm of water gauge, Temperature of flue gas-360ºC, Temperature of boiler house-28ºC, Atmospheric pressure-1.013 bars. Determine the quantity of air used per kg of fuel burnt in the boiler. **[7]**

b) Define the following terms: **[6]**

i) Mass Fraction

ii) Mole Fraction

iii) Stoichiometric Air

iv) A/F ratio

v) HCV

vi) LCV

Q7) a) Define Human comfort condition and discuss the factors affecting human comfort. **[6]**

b) State Daltons law of partial pressure and Write the following Psychrometric Relations and clearly state the name of each variable: **[7]**

i) Specific humidity

ii) Degree of saturation and

iii) Relative humidity

OR

Q8) a) Draw the Psychrometric chart and show the following on it: **[7]**

i) RH line

ii) Specific humidity lines

iii) Saturation curve

iv) DBT lines

v) WBT lines

vi) Specific volume lines and

vii) Specific enthalpy lines

b) Draw neat labelled diagram for the following Psychrometric processes:**[6]**

i) Adiabatic mixing of two air streams and

ii) Cooling and dehumidification



Total No. of Questions : 8]

SEAT No. : ____

P9410

[Total No. of Pages : 4

[6179]-35

S.E. (Mechanical/Automobile/Mechanical S.W)

STRENGTH OF MATERIALS

(2015 Pattern) (Semester - I) (202051)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Answser questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) A 400 mm long bar has rectangular cross-section 10 mm x 30 mm. This bar is subjected to **[6]**

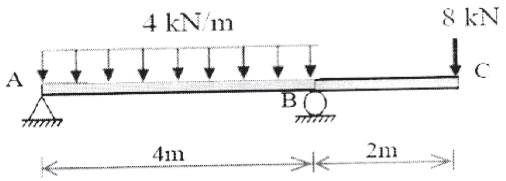
i) 15 kN tensile force on 10mm × 30 mm faces.

ii) 80 kN compressive force on 10 mm × 400 mm faces and

iii) 180 kN tensile force on 30 mm × 400 mm faces.

Find the change in volume if E 2×10^5 N/mm^2 and $\mu = 0.3$.

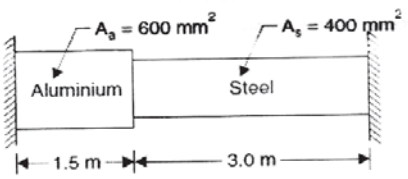
b) Find the Shear Force Diagram and Bending Moment diagram of the following figure. **[6]**



OR

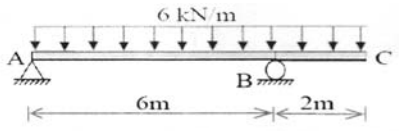
Q2) a) The composite bar is rigidly fixed at the ends A and B. Determine the reaction developed at ends when the temperature is raised by 18°C. Given Ea = 70 kN/mm^2, Es 200 kN/mm^2, **[6]**

$\alpha_{al} = 11 \times 10–6/°C$ $\alpha_{steel} = 12 \times 10–6/°C$

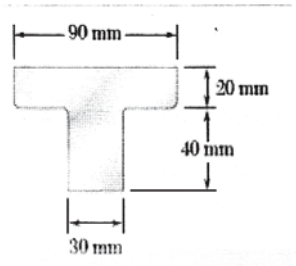


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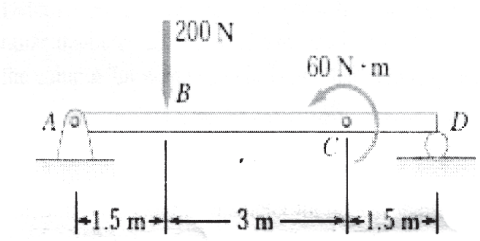
b) Find the Shear Force Diagram and Bending Moment diagram of the following figure **[6]**



Q3) a) A cast-iron machine part is acted upon by the 3 KN-m bending moment. Knowing that E = 165 GPa and neglecting the effect of fillets, determine (a) the maximum tensile and compressive stresses in the casting, (b) the radius of curvature of the casting. **[6]**

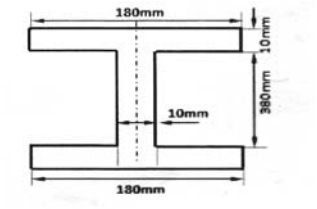


b) The simply supported beam supports a concentrated load of 200 N and Couple of 60 Nm asshown. Using E 2×10^5 N/mm^2 I = 168×10^5 mm^4 determine (1) the slope angle of the elasticcurve at D; and (2) the deflection atC. **[6]**

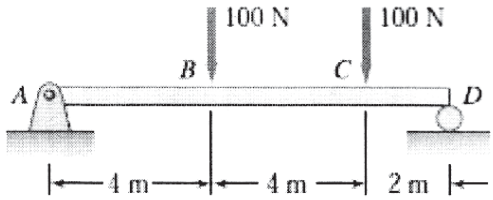


OR

Q4) a) Draw the shear stress variation diagram for the I-section shown in Fig.if it is subjected to a shear force of 100 kN. **[6]**



b) The simply supported beam supports a concentrated load of 100 N as shown. Using $E = 2 \times 10^5$ N/mm^2 $I = 26 \times 10^5$ mm^4
determine (1) the slope angle of the elastic curve at D; and (2) the deflection at C. **[6]**



Q5) a) A hollow circular shaft 150 mm external diameters & thickness of metal 20mm is transmitting power at 200rpm. The angle of twist over a length of 1.5m was found to be 0.3º calculate the power transmitted & the maximum shear stress induced in section, take G75KN/mm^2. **[6]**

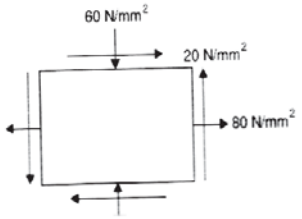
b) Determine the crippling load for a hollow rectangular cast iron column of outer diameter 250mm × 1 75mm, thickness of metal 15mm, actual height of the column 7m with one end fixed other is free, consider E = 120Gpa**[7]**

OR

Q6) a) Compare the weight of equal length of hollow & solid shaft to resist same torsional moment for same maximum shear stress. Assume internal diameter 0.65 times the external diameter for hollow shaft. **[6]**

b) A 60mm × 120mm timber is used as a column with fixed ends. Determine the minimum length at which Euler's formula can be used if E = 10Gpa & proportional limit is 25MPa. What central load can be carried with factor of safety is 2, if the length is 3m? **[7]**

Q7) a) The state of stress in a material stressed to two-dimensional state of stress is as shown in Figure. Determine principal stresses and maximum shear stress and the planes on which they act. **[6]**



b) A SAE 1045 steel shaft of 80mm diameter is subjected to a bending moment of 3 KN-m and a torque T KN-m. If the yield point of the steel in tension is 309.9 MPa and taking factor of safety as 2.5, find the maximum value of torque T without causing yielding of the shaft according to the maximum normal stress theory. **[7]**

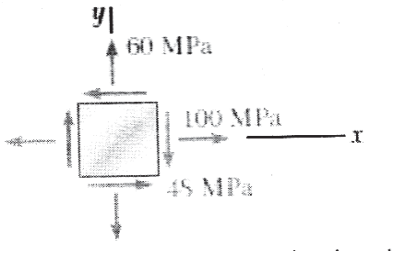
OR

Q8) For the state of plane stress shown, determine by graphical and analytical methods **[13]**

a) The principal stresses with its orientation only by Mohr's circle.

b) The maximum Shear stress with its orientation only by Mohr's circle.

c) The normal and shear stresses on a plane 20^{o} anticlockwise direction with x-plane by Mohr's circle and also verify this answer with an analytical approach



Draw Mohr's circle with proper scale factor and using drawing instruments. Analytical formula can't be used to solve question no (a) & (b).

Total No. of Questions : 8]

SEAT No. :

P-9411

[Total No. of Pages : 2

[6179]-36
S.E. (Mechanical/Automobile Engineering)
MANUFACTURING PROCESS - I
(2015 Pattern) (Semester - I) (202041)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data,if necessary.***

Q1) a) State the importance of allowances for pattern making.Explain characteristics of good moulding sand. **.[6]**

b) A 250 mm wide strip of 27 mm thickness is reduced to 24 mm in a single pass through a rolling process. The radius of each roller is 250 mm and its speed is 150 rpm. The strength coefficient for the work material is 275 N/mm^2.and n=0.15. The coefficient of friction between the workpiece and roll is 0.15. Find the roll force,torque and power required per roll. **[6]**

OR

Q2) a) What do you understand by recrystallisation and recrystallisation temperature? Differentiate between hot working and cold working process. **[6]**

b) A cylindrical riser must be designed for a sand casting mould.The size of steel casting is 75mm × 125 mm × 20 mm. The observation done earlier have indicated that the total solidification time for casting is 90 sec. The cylindrical riser has (d/h) = 1. Find the size of riser so that its solidification time is 120 sec. **[6]**

Q3) a) Explain injection moulding process with suitable sketch.Also state the applications of it. **[6]**

b) Explain principle of resistance welding. State it advantages and limitations. **[6]**

OR

P.T.O.

Q4) a) Compare the thermosetting plastic and thermoplastic. State any two general properties and application. **[6]**

b) Write a short note on edge preparation in welding. List down different weld defects. **[6]**

Q5) a) State the necessity of reducing cutting forces in sheet metal works.Explain with neat sketch any two methods. **[7]**

b) What is center of Pressure? List down the procedure to calculate the center of pressure. **[6]**

OR

Q6) a) Differentiate between compound die and progressive die. State the different sheet metal working operations. **[7]**

b) Calculate blank size required for drawing a cylinder cup of internal diameter 50 mm height of cup 85 mm, blank thickness 2 mm. Draw ratio restricted 45% in one draw, how many draws will be required if ultimate tensile strength is 427 N/mm^2. Calculate drawing force required. (change value) **[6]**

Q7) a) Write the different operations performed on lathe machine, Explain it with neat sketch. **[7]**

b) Calculate the machining time required for 3 passes while reducing 60mm diameter shaft to 50 mm diameter for a length of 1200 mm with depth of cut of 2 mm for rough cut and 1 mm for finish cut. Given cutting speed =25, m/min,feed 0.5 mm/rev, approach length = 5mm and overrun length =5mm (take approach length value -10mm). **[6]**

OR

Q8) a) What are different taper turning methods? Explain tailstock offset method with proper sketch. **[7]**

b) Explain any three lathe operations with sketch. **[6]**

Total No. of Questions : 8] **SEAT No. :**

P9412 **[Total No. of Pages : 2**

[6179]-37
S.E. (Mechanical/Automobile)
MATERIAL SCIENCE
(2015 Pattern) (Semester - I) (202044)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Solve Que.1 or Que.2, Que.3 or Que.4, Que.5 or Que.6, Que.7 or Que.8.***
2) ***Give explanation or justification wherever necessary.***

Q1) a) Compare between addition and condensation polymerization. **[4]**

b) Classify engineering ceramics and how they are differ from natural ceramics and metals. **[3]**

c) Analyze with diagram degree of cold work, recovery, recrystallization and grain growth in steel metal. **[6]**

OR

Q2) a) Examine the plane and also show plane direction for following Miller indices. **[6]**

(132), (1-01), (2 3 6)

b) Define Schmid's law. Derive the expression for deformation of single crystal by slip. Calculate CRSS for Zinc single crystal if the applied tensile stress is 60 Kg/mm2. The plane is oriented at 60^{o} the tensile axis.**[7]**

Q3) a) Define fatigue. Analyze with sketch fatigue test and factors affecting fatigue failure of materials. **[6]**

b) Estimate PBR. Also discuss hydrogen blistering and hydrogen attack.**[6]**

OR

Q4) a) A tensile test was conducted on MS specimen of diameter 14.5mm and gauge length 60 mm. The loads at lower and upper yield points were 4600 Kg and 4700 Kg respectively. The maximum and fracture loads were 7800 Kg and 5100 Kg respectively. The gauge length after fracture was 72.5 mm and diameter at fracture place was found to be 9mm. Determine, **[6]**

i) Lower yield stress
ii) Upper yield stress
iii) UTS
iv) Fracture stress
v) True fracture stress
vi) % elongation and
vii) % reduction in cross sectional area.

P.T.O.

b) Explain the various corrosion prevention techniques. What is the role of Design consideration in corrosion prevention. **[6]**

Q5) a) Identify various coating defects. Discuss the techniques to eliminate coating defects. **[4]**

b) Construct how the surface preparation techniques play important role in surface modification. Also explain some of the techniques to prepare the surface before coatings. **[5]**

c) Explain with PVD and CVD process. **[4]**

OR

Q6) a) Apply the techniques: **[6]**

i) Anodizing &

ii) Ion implantation for thin sheet application.

b) Identify how powder coating is superior than conventional spray painting techniques. Explain with sketch electro static-fluidized bed power coating. **[5]**

c) Construct well labeled sketch of Tinning process. **[2]**

Q7) a) Summarize how the power metallurgical techniques are superior than casting and forging techniques. Also discuss the limitations of same in comparison with casting and forging. **[4]**

b) Illustrate suitable manufacturing techniques for manufacturing of self lubricating bearing and shoes of internal expanding brakes. Justify your answer. **[4]**

c) Interpret powder compaction and how it affects on density and strength of compact. **[4]**

OR

Q8) a) Illustrate the flow chart for manufacturing Cemented carbide tools using powder metallurgy techniques. **[4]**

b) Interpret pre-sintering and with sketch explain liquid phase sintering. **[4]**

c) Compare powder characteristics as-Green spring, Green density, tap density and apparent density. **[4]**

Total No. of Questions : 8]

SEAT No. :

P9413

[Total No. of Pages :2

[6179]-38
S.E. (Mech./Auto.)
FLUID MECHANICS
(2015 Pattern) (Semester-II) (202045)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicates full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) Define the following terms & state their SI units **[6]**

i) Specific gravity

ii) Surface Tension

iii) Dynamic Viscosity

b) Check whether the flow of liquid given by **[6]**

$4 = 5x$ & $V = -5y$ is

i) Continuous

ii) Rotational

OR

Q2) a) Explain the following: **[6]**

i) Hydrostatics Law

ii) Newtons law of Viscosity

iii) Capillarity

b) An equilateral triangle of side 2.5m is immersed completely in the water with one of its axis of symmetry parallel to the water surface. Its top edge is at 1m below free surface of water. Determine the total pressure & position of center of pressure. **[6]**

Q3) a) Derive Bernoulli's equation using Euler's equation of motion along a stream line. **[6]**

b) A 200mm × 100mm venturimeter is provided in a vertical pipe carrying water flowing in an upward direction. A differential manometer connected to the inlet & throat gives a reading of 220mm, find the rate of flow. **[6]**

OR

P.T.O.

Q4) a) Derive an expression of discharge & average velocity for laminar flow through circular pipe. **[6]**

b) An oil of viscosity 0.2 pa.s & specific gravity 0.85 flows through a circular pipe of diameter 75mm & length 250m. The rate of flow of oil through the pipe is 5 lps. Find the pressure drop in a length of 250m & shear stress at the pipe wall. **[6]**

Q5) a) Explain the following dimensionless numbers **[6]**

i) Euler's Number

ii) Froude's Number

iii) Weber's Number

b) Oil is pumped in a horizontal 150mm diameter pipe 200m long. The specific gravity of oil is 0.89 & kinematic viscosity 1.3 stokes. The friction factor for the flow is given by 64/Re. If has 25HP to drive the pump of efficiency 65%. Find the rate of flow of oil. **[7]**

OR

Q6) a) Derive an expression for Darcy Weisbach equation. **[6]**

b) Show that discharge over a rectangular notch is given by **[7]**

$$Q = VL^2 f\left\{\frac{\sqrt{gL}}{V}, \frac{H}{L}\right\}$$

Q7) a) The velocity distribution in boundary layer on a fixed plate is given by **[6]**

$\frac{u}{U} = \frac{y}{\delta}$, where u is the velocity at a distance y from the plate & u=U at $y=\delta$, δ being the boundary layer thickness find (i) The displacement thickness (ii) The energy thickness

b) Derive an expression for displacement, momentum & energy thickness.**[7]**

OR

Q8) a) Write a short note on separation of boundary layer & its method of control. **[9]**

b) Differentiate between streamlined & Bluff body. **[4]**



Total No. of Questions : 8]

SEAT No. :

P9414

[Total No. of Pages :2

[6179]-39
S.E. (Mechanical/Automobile)
ENGINEERING METALLURGY
(2015 Pattern) (Semester-II) (202049)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicates full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Neat diagrams must be drawn, wherever necessary.***

Q1) a) Define the following: **[4]**

i) Cast Iron

ii) Phase

iii) Steel

iv) Alloys

b) Explain Hume Ruthery's rule of solid solubility **[4]**

c) Explain the solidification of pure metal. **[4]**

OR

Q2) a) Explain in detail the preparation of specimen for microstructure observation? **[4]**

b) Differentiate between Microscopy and Macroscopy **[4]**

c) Write short note on any two process of the following: **[4]**

i) Sulphur Printing

ii) Flow line Observation

iii) Spark Test

Q3) a) What are the advantages of cast iron over steels? **[3]**

b) Compare Gray Cast Iron &White Cast Iron with respect to composition, microstructure, application. **[6]**

c) Give brief information of Austenite to Pearlite Transformation. **[4]**

OR

P.T.O.

Q4) a) Draw Iron carbon equilibrium diagram **[3]**

b) Compare Annealing and hardening **[6]**

c) Draw TTT Diagram **[4]**

Q5) a) Give classification of steels on the basis of carbon Content **[4]**

b) Explain Sensitization of stainless steel? State process to minimize it? **[4]**

c) What are stainless steels? Give typical composition and two uses of the various types of stainless steels? **[4]**

OR

Q6) a) Name the different standards used for the Designation of Steels. Give examples of each standard. **[4]**

b) What is High Speed Steel? State and explain the important properties of the two types of high speed steels. **[4]**

c) What do you mean by AISI 1030 & FE-230. **[4]**

Q7) a) a)Explain classification of Cu base alloys based on the percentage of Cu and Zn? Explain role of Zn in brasses **[6]**

b) What is Age Hardening. **[4]**

c) Write a short note on Bearing Materials. **[3]**

OR

Q8) a) Give the composition of duralumin. What are its properties? **[6]**

b) Give typical composition, property and application for the following (any four): **[4]**

i) LM14

ii) Invar

iii) Statuary bronze

iv) Cartridge brass

v) Gliding Metal

c) What are the requirements of bearing materials? Explain with suitable example. **[3]**



Total No. of Questions : 8] **SEAT No. :**

P9415 **[Total No. of Pages : 3**

[6179]-40
S.E. (Mechanical/Automobile)
THEORY OF MACHINES - I
(2015 Pattern) (Semester - II) (202048) (Theory)

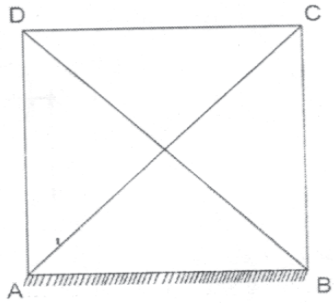
Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of calculator is allowed.***

Q1) a) Define equivalent linkage of mechanism. Explain any one inversion of double slider crank chain with neat sketch. **[6]**

b) Find degrees of freedom for the six bar mechanism shown in the figure. **[4]**



OR

Q2) a) The mass of a connecting rod is 6 kg and 600 mm long between the centers. Its C.G. is 450 mm from the centre of small end. about which connecting rod oscillates in a vertical plane and completes 40 oscillations in 62 seconds. Find mass moment of inertia of the connecting rod about an axis through its C.G. **[5]**

b) Explain friction circle in journal bearing with neat sketch. **[5]**

Q3) a) Explain with neat diagram the belt transmission dynamometer. **[4]**

b) A multiple clutch has three pairs of contact surfaces. The outer and inner radii of the contact surfaces are 100 mm and 50 mm respectively. The axial spring force is limited to 1 kN. Assuming uniform wear, find the power transmitted at 1500 rpm. Take $\mu = 0.35$. **[6]**

OR

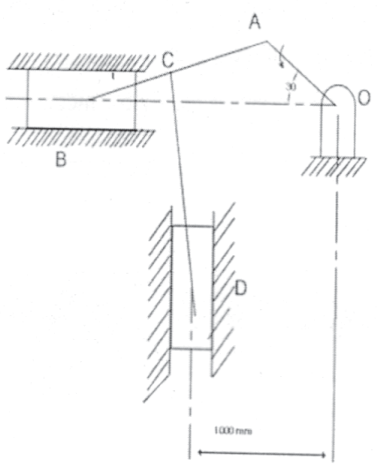
P.T.O.

Q4) a) Derive loop closure equation for Slider-crank mechanism. **[4]**

b) The driving shaft of a single Hooke's joint rotates at 800 rpm. The angle between driving and driven shafts is 15º. Find the highest and lowest magnitude of driven shaft in rpm. 2. Calculate angle of driving shaft when speed of driving and driven shafts is same. 3. Also draw the polar diagram of the Hook's joint, indicating all the important values. **[6]**

Q5) a) Explain with neat sketch the concept of 'Velocity Image Principle'. **[3]**

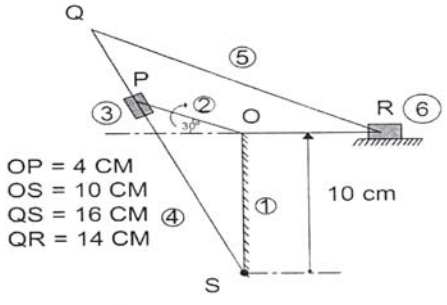
b) Fig. shows, Crank OA of a compound slider crank mechanism, rotates at 20 rpm counter clockwise and gives motion to sliding blocks B and D. The dimensions of different links are: OA = 300 mm, AB = 1200 mm, BC = 450 mm and CD = 450 mm. Determine the linear acceleration of block D. **[12]**



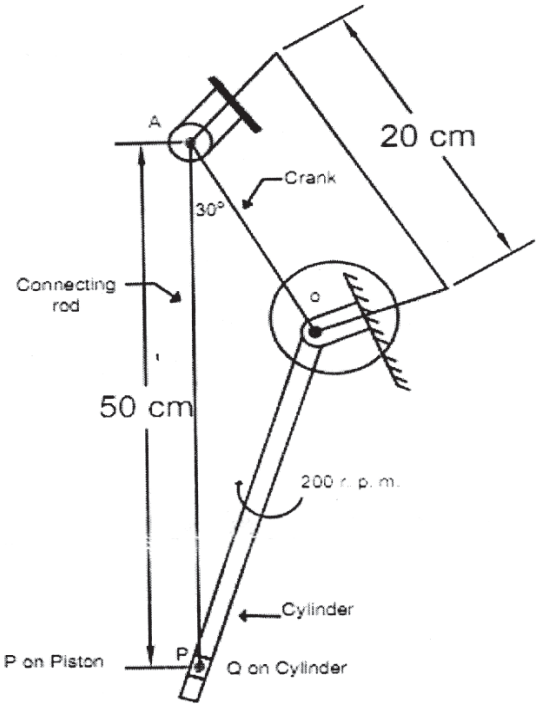
OR

Q6) a) Explain 'Kennedy's theorem 'of three centers inline. **[3]**

b) The Figure shows the shaper mechanism. The crank OP rotates at 20 rad/sec. For the configuration shown, determine the angular velocity of link 4 and link 5 and sliding velocity of cutting tool. The angular velocity of link 2 (ωop) is 20 rad/sec. **[12]**



Q7) a) Figure show a rotating cylinder engine mechanism. Determine the acceleration of the piston inside the cylinder, if the cylinder rotates uniformly at 200 rpm. The crank OA is fixed. **[12]**



b) Explain the procedure to construct Kline's construction to determine the acceleration of a slider crank mechanism. **[3]**

OR

Q8) a) The crank of reciprocating engine is 250 mm long and connecting rod is 950 mm long. The crank rotates at 200 rpm in clockwise direction. Find velocity and acceleration of piston. Also find angular acceleration and angular velocity of the connecting rod when the crank rotates through 30º from IDC. Use Klein's construction method. **[12]**

b) Explain the procedure to decide direction of coriolis component of acceleration with neat sketch. **[3]**

Total No. of Questions : 8]

SEAT No. : ____

P-9416

[Total No. of Pages : 3

[6179]-41
S.E. (Automobile/Mechanical Engineering)
APPLIED THERMODYNAMICS
(2015 Pattern) (Semester - II) (202050)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of Scientific calculator, Steam Tables, Mollier Diagram is allowed.***

Q1) a) Draw valve timing diagram for four stroke petrol engine. Give reason for early opening of exhaust valve and late closing of inlet valve. **[6]**

b) Explain with neat diagram the working of simple carburetor. **[6]**

OR

Q2) a) List down the different losses in real cycle and Explain time loss and exhaust blowdown loss in short. **[6]**

b) Explain the stages of combustion in SI engine with the help of P-θ diagram. **[6]**

Q3) a) What are the functions of nozzles. Explain pintaux nozzle with neat sketch. **[6]**

b) A 4 cylinder gasoline engine operates on 4 stroke cycle. Bore of cylinder is 80 mm and stroke 100 mm. Clearance volume per cylinder is 80 CC. At 4,000 RPM, Fuel consumption is 20 kg/hr and the torque developed is 200 N-m. Calculate :

i) BP

ii) Brake specific fuel consumption

iii) Brake thermal efficiency

If CV of the fuel is 43,000 kJ/kg, find relative efficiency on brake power basis, assuming engine works on constant volume cycle and γ for air = 1.4 **[6]**

P.T.O.

OR

Q4) a) Explain with figures various types of combustion chambers used in CI engines. **[6]**

b) During the trial of a single cylinder, four stroke oil engine, the following results were obtained. **[6]**

Friction Power	= 10 KW
Speed	= 1750 rpm
Brake Torque	= 327.5 N-m
fuel used	= 15 kg/hr
Calorific value of fuel used	= 42 MJ / kg
Air supplied	= 285 kg/hr
Volume flow rate o Cooling water	= 14 lit / min
Room temperature	= 21°C
Rise in cooling water temperature	= 45°C
Temperature of exhaust gases	= 400°C
Mean specific heat of exhaust gas	= 1.23 kJ/kgK
Specific heat of water	= 4.18 kJ/kgK

Find ISFC. Also draw heat balance sheet on KW basis for the test.

Q5) a) Explain with neat diagram battery ignition system. **[6]**

b) Explain the variation of HC, CO and NOx emission with respect to air fuel ratio for SI Engine. **[7]**

OR

Q6) a) How does positive crankcase ventilation system reduce the pollution due to crankcase blow-by? Explain with diagram **[6]**

b) Explain with neat diagram Splash Lubrication System. **[7]**

Q7) a) Derive the expression for volumetric efficiency and enlist the various factors affecting volumetric efficiency. **[6]**

b) A single stage single acting reciprocating air compressor has air entering at 1 bar, 15°C and compression occurs following polytropic process with index 1.25 upto delivery pressure of 12 bar. The compression runs at the speed of 240 rpm and has L/D ratio of i.8. The compressor has mechanical efficiency of 85%. Determine the isothermal efficiency and cylinder dimensions. Also find out rating of drive required to run the compressor which admits 1 m^3 of air per minute. **[7]**

OR

Q8) a) Explain Roots blower compressor with neat sketch. **[6]**

b) A two stage reciprocating air compressor takes in air at 1.013 bar and 27°C .Air is delivered at 12 bar. The intermediate pressure is ideal with perfect intercooling.Compression follows the polytropic law with index 1.2.The rate of discharge 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.

Total No. of Questions : 8] **SEAT No. :**

P9417 **[Total No. of Pages : 2**

[6179]-42

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

ELECTRICAL AND ELECTRONICS ENGINEERING

(2015 Pattern) (Semester - II) (203152)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Attempt Ques.1 or 2, 3 or 4, 5 or 6, 7 or 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Draw the schematic of three point starter and write the functions of inductive coils used in it. **[6]**

b) A 400 V, 50 Hz three phase induction motor is drawing 50 A at 0.8 power factor lagging. The stator losses are 2 KW and rotor copper losses are 700 W. The friction and windage loss is 1400W. Calculate:**[7]**

i) stator output power

ii) mechanical power developed

iii) output power of motor

iv) efficiency of motor

OR

Q2) a) Differentiate between squirrel cage induction motor and slip ring induction motor; mentioning any six significant points. **[6]**

b) A 220 V, DC shunt motor runs at 1000 rpm when the armature current is 25 A. Calculate the speed if the torque developed is doubled. Given that armature resistance is 0.25 Ω. **[7]**

Q3) a) Explain following conditional statements in the context of Arduino IDE:**[6]**

i) Do....while

ii) If....else

b) Explain the construction and working of a shaded pole induction motor with the help of suitable diagrams. Mention its any two applications.**[6]**

OR

P.T.O.

Q4) a) Write any six significant features of A Tmega 328P microcontroller. **[6]**

b) Differentiate between DC series motor and AC series motor. **[6]**

Q5) a) Write any three features of Timer T_0 and Timer T_1 in A Tmega 328P microcontroller. **[6]**

b) Explain the use of following functions during serial communication using Arduino IDE: **[6]**

i) Serial.begin()

ii) Serial.end()

OR

Q6) a) Explain the GPIO functions in ATmega328P based Arduino board. **[6]**

b) Draw the interfacing diagram for keypad interfacing with Arduino Board and hence write the algorithm for interfacing. **[6]**

Q7) a) What is an accelerometer? Draw the block diagarm of interfacing an accelerometer with Arduino. **[6]**

b) Explain the use of strain gauge as a transducer by quoting one suitable example and hence draw its interfacing diagram with Arduino. **[7]**

OR

Q8) a) Write any six features of in built ADC in ATmega 328P microcontroller. **[6]**

b) Explain the concept of PWM and its application in DC motor interfacing with Arduino. Hence draw the interfacing diagram. **[7]**

Total No. of Questions : 8]

SEAT No. : ____

P-9702

[Total No. of Pages : 3

[6179]-51

S.E. (Electrical Engineering)

NETWORK ANALYSIS

(2015 Course) (Semester - II) (203147)

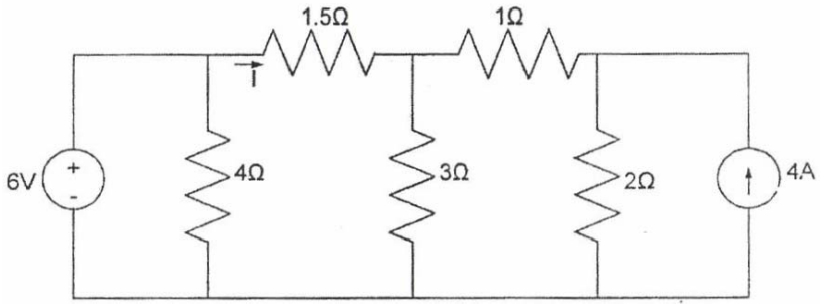
Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

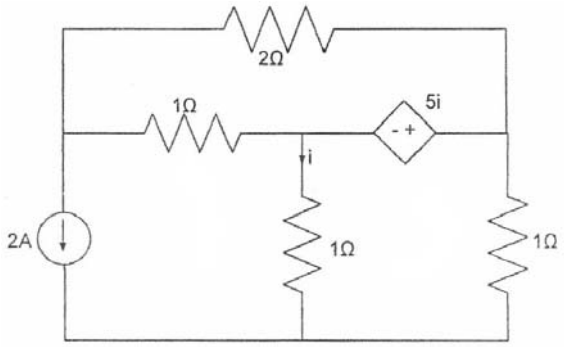
Q1) a) State and explain duality principle in network. **[6]**

b) Use superposition theorem to find current 'I' in the circuit shown in figure. **[7]**



OR

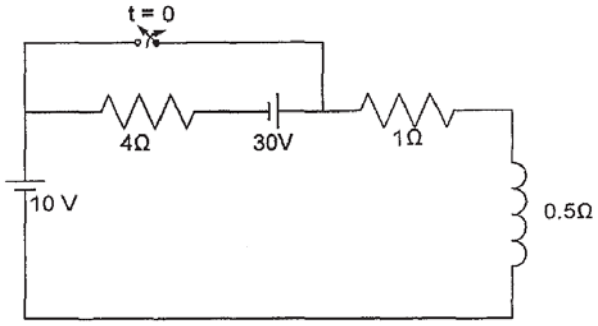
Q2) a) Using mesh analysis, find magnitude of dependent source. **[7]**



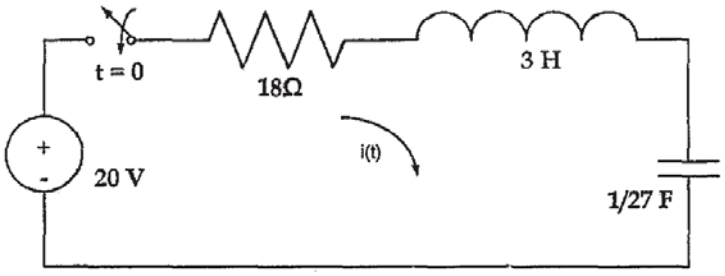
b) State and explain maximum power transfer theorem as applied to AC circuits. **[6]**

P.T.O.

Q3) a) Find current through inductor at t = 2 seconds after switch is opened. **[6]**



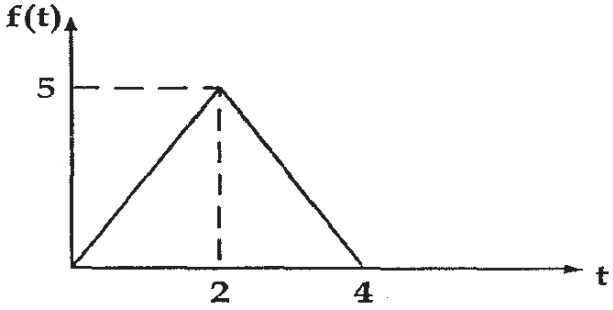
b) Find current using Laplace transform technique in the given network. **[6]**



OR

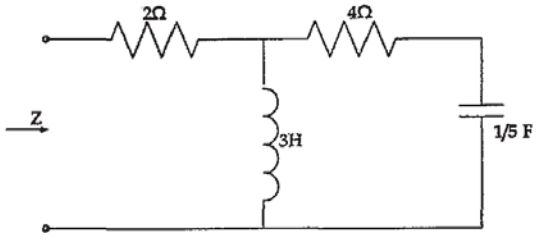
Q4) a) Obtain expression for voltage across capacitor in series RC circuit connected to DC voltage V for t > 0. Assume initial charge across capacitor is zero. **[6]**

b) Obtain F(S) for signal shown in figure. **[6]**



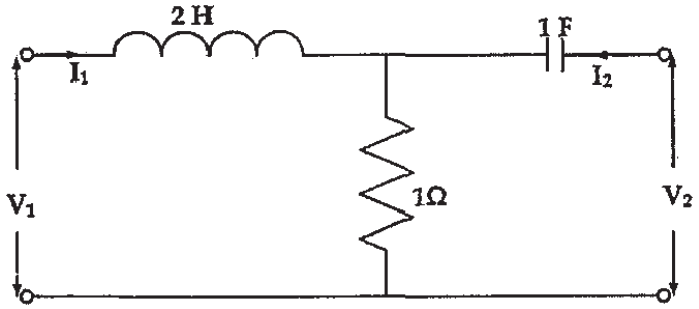
Q5) a) Obtain Z parameters in terms of ABCD parameters. **[6]**

b) Find the driving point impedance for network shown in figure. **[7]**

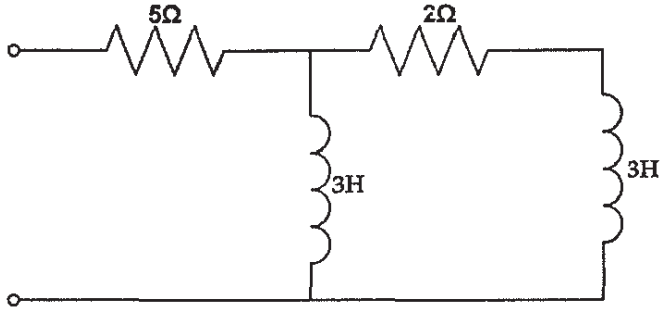


OR

Q6) a) For the network shown in figure find Z parameters. **[6]**



b) Find driving point admittance $Y_{11}(s)$ for the network shown in figure. Also plot pole zero diagram. **[7]**



Q7) a) Design a prototype low pass filter (Π and T section) if design impedance R_0 = 500 Ω and cut-off frequency F_C = 2000 Hz. **[6]**

b) What is low pass filter? Derive the expression for cut-off frequency and design impedance for low pass filter. **[6]**

OR

Q8) a) A prototype high pass filter has cut-off frequency of 10 kHz and design impedance of 600 Ω. Find value of L and C. Also find attenuation in dB and phase shift in degrees at frequency of 8 kHz. **[6]**

b) Explain the following in relation with filters : **[6]**

i) Stop band

ii) Pass Band

iii) Cut-off frequency