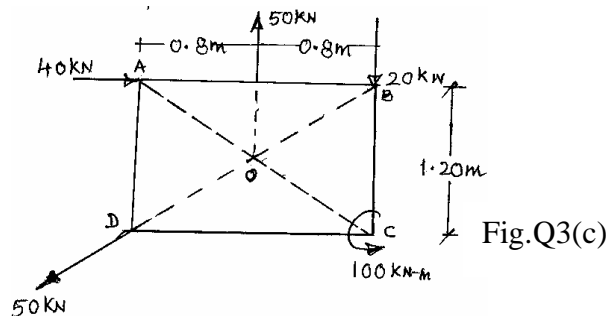
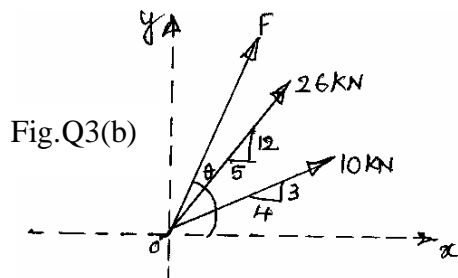


3. a. Select the correct answer : (04 Marks)
- i) The process of finding the resultant of a system of forces is called
 A) Resultant B) Resolution C) Composition D) None of these
 - ii) If two forces P and Q ($P > Q$) act on the same straight line but in opposite direction their resultant is
 A) $P + Q$ B) $\frac{P}{Q}$ C) $Q - P$ D) $P - Q$
 - iii) Component of a force at a right angles to its line of action is
 A) Zero B) Positive C) Negative D) None of these
 - iv) In a coplanar concurrent force system if $\Sigma H = 0$, then the resultant is
 A) Horizontal B) Vertical C) Moment D) None of these
- b. The 26kN force is the resultant of two forces, one of which is shown in fig.Q3(b). Determine the other force. (08 Marks)



- c. A rigid plate is subjected to the forces as shown in fig.Q3(c), compute resultant of forces and position of resultant force with respect to centroid point 'O' of the plate. (08 Marks)
4. a. Select the correct answer : (04 Marks)
- i) Centroid of semicircle of radius 'R' about its centroidal axis parallel to diametric axis is
 A) $\frac{3R}{4\pi}$ B) $\frac{3R}{8\pi}$ C) $\frac{4R}{\pi}$ D) $\frac{4R}{3\pi}$
 - ii) An axis over which one half of plane figure is just mirror image of the other half is
 A) Axis of symmetry B) Unsymmetrical axis
 C) Bottom most axis D) None of these
 - iii) Moment of total area about its centroidal axis is
 A) Twice the area B) Three times the area
 C) Zero D) None of these
 - iv) The centroid of a triangular lamina of height 'h' is situated at a distance ____ from its apex.
 A) $\frac{h}{3}$ B) $\frac{2h}{3}$ C) $\frac{h}{2}$ D) $\frac{h}{4}$

- b. Locate the centroid of the shaded area shown in fig.Q4(b), with respect to point 'O'.
(08 Marks)

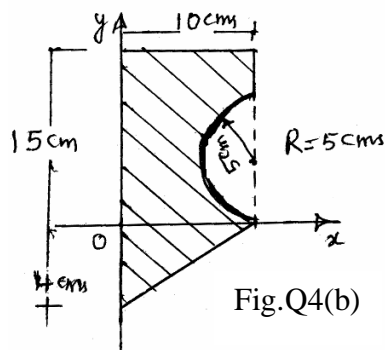


Fig.Q4(b)

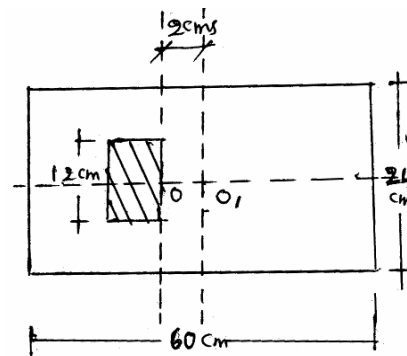


Fig.Q4(c)

- c. The centroid of the rectangular area requires to be shifted from point 'O' to O₁ (2 cms). This is accomplished by removing hatch portion which is 12cm deep and symmetrical about X X-axis. Determine area of hatched portion shown in fig.Q4(c). (08 Marks)

PART - B

5. a. Select the correct answer : (04 Marks)
- The force which is equal and opposite to resultant is
A) Resultant force B) Moment
C) Equilibrant D) None of these
 - A particle acted upon by the two forces of equal magnitude is in equilibrium. The angle between the forces is
A) 0° B) 90° C) 180° D) 45°
 - The necessary condition of equilibrium of a coplanar concurrent force system is algebraic sum of _____ must be zero.
A) Horizontal and Vertical forces B) Moment of forces
C) Horizontal vertical and moment of forces
D) None of these
 - Lami's equation can be applied when number of unknown forces are ____
A) TWO B) Five C) Four D) Three
- b. Determine the angle θ for the system of strings ABCD in equilibrium as shown in fig.Q5(b). (08 Marks)

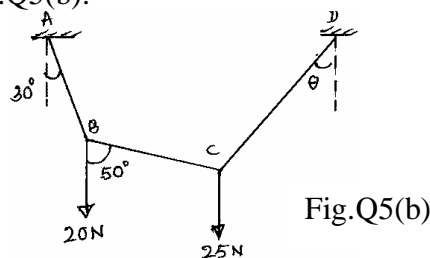


Fig.Q5(b)

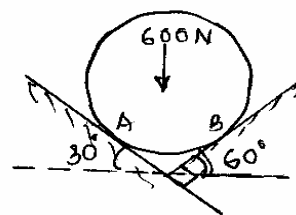
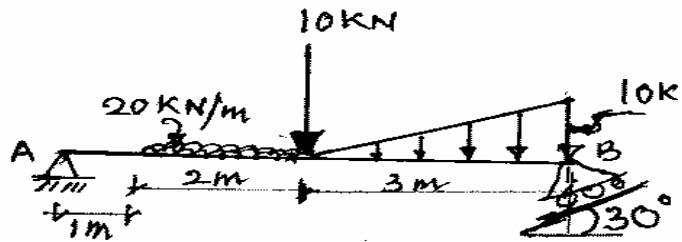
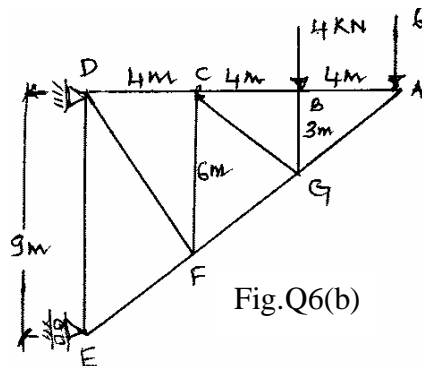


Fig.Q5(c)

- c. A cylinder of weight 600N rests on smooth surfaces as shown in fig. Q5(c). Determine the reactions at contact points. The contact surfaces are perpendicular to each other. (08 Marks)
6. a. Select the correct answer : (04 Marks)
- A cantilever beam is one in which ____
A) Both ends are fixed B) Both ends are hinged
C) One end is fixed and other end is simply supported
D) One end is fixed and other end is free.

- ii) A truss is perfect when
 A) $m = 2j - 3$ B) $2j = m + 3$ C) $m = 3j - 2$ D) $2j = m - 3$
- iii) The minimum number of members to form a perfect truss is
 A) 1 B) 2 C) 3 D) 4
- iv) The number of reaction components at a hinged end of a beam
 A) zero B) 2 C) 3 D) 1
- b. A pin jointed truss is loaded and supported as shown in fig.Q6(b). Determine forces in members BC, GF and CG and nature of forces. Use method of section. (08 Marks)



- c. Find the reactions for the beam supported and loaded as shown in fig.Q6(c).(08 Marks)

7. a. Select the correct answer : (04 Marks)

- i) Compared to static friction, kinetic friction is
 A) greater B) smaller C) very large D) zero
- ii) Frictional force acts _____ to the surfaces in contact
 A) Tangential B) Normal C) Inclined D) None of these
- iii) The force of friction depends on
 A) Area of contact B) Roughness of surfaces
 C) Both area of contact and roughness of surfaces
 D) None of these
- iv) At the point of impending motion, the static frictional force is
 A) Zero B) Maximum C) Minimum D) Infinite

- b. State laws of static friction. (04 Marks)

- c. Briefly explain i) Angle of repose ii) Cone of friction. (04 Marks)

- d. A ladder 7m long weighing 300N is resting against a wall at an angle of 60° to the horizontal ground. A man weighing 700N climbs the ladder, at what position does he induce slipping. Take $\mu = 0.25$ for all contact surfaces. (08 Marks)

8. a. Select the correct answer : (04 Marks)

- i) Moment of inertia of a square of side 'b' about an axis through its centroid is

A) $\frac{b^4}{12}$ B) $\frac{b^4}{8}$ C) $\frac{b^4}{36}$ D) $\frac{b^3}{12}$

- ii) Moment of inertia of a triangle of base 'b' and height 'h' about its base is

A) $\frac{bh^3}{36}$ B) $\frac{bh^4}{36}$ C) $\frac{hb^3}{12}$ D) $\frac{Bh^3}{12}$

- iii) The unit of radius of gyration is

A) mm B) mm^2 C) KN - m D) mm^4

- iv) Which of the following equation relating to radii of gyration is correct?

A) $K_{zz} = K_{xx} + K_{yy}$ B) $K_{xx} = K_{yy} + K_{zz}$
 C) $K_{zz}^2 = K_{xx}^2 + K_{yy}^2$ D) None of these

- b. State and prove parallel axis theorem. (06 Marks)
- c. Determine moment of inertia and radius of gyration of the area shown in fig.Q8(c), about base AB and centroidal axis parallel to AB. (10 Marks)

