

- c. Two forces of 800 N and 600 N act at a point as shown in the Fig.Q3(c). The resultant of two forces is 1200 N. Determine θ between the forces and the direction of the resultant.

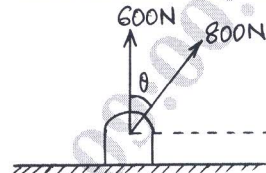


Fig.Q3(c)

(06 Marks)

OR

- 4 a. Explain the following :
 (i) Coefficient of friction (ii) Angle of friction (ii) Angle of Repose
 (iv) Cone of friction, with neat diagrams. (08 Marks)
 b. Determine the reactions at contact points P, Q, R and S for the system shown in the Fig.Q4(b). The radii the spheres 1 and 2 are, respectively, 20mm and 30mm.

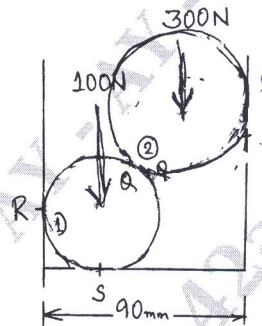


Fig.Q4(b)

(08 Marks)

Module-3

- 5 a. State and prove Varignon's theorem. (06 Marks)
 b. Determine the reactions at 'A' and 'E' for the beam shown in the Fig.Q5(b).

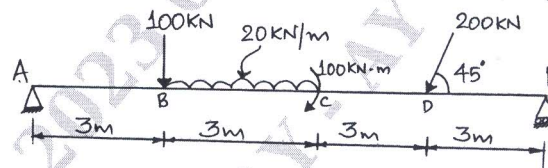


Fig.Q5(b)

(10 Marks)

OR

- 6 a. Explain the different types of supports and loads in the analysis of beams. (08 Marks)
 b. Determine the magnitude, direction of the resultant force for the force system as shown in the Fig.Q6(b). Locate the resultant force with respect to point D.

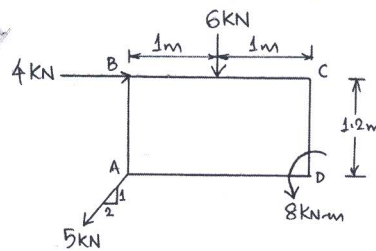


Fig.Q6(b)

(08 Marks)

Module-4

- 7 a. Distinguish between Centroid and Centre of gravity. (02 Marks)
 b. Derive the expression for the centroid of triangle from first principles. (06 Marks)
 c. Compute the second moment of built-up area shown in the Fig.Q7(c) about its centroidal axis and find the corresponding radius of gyration (Note: all dimensions in mm)

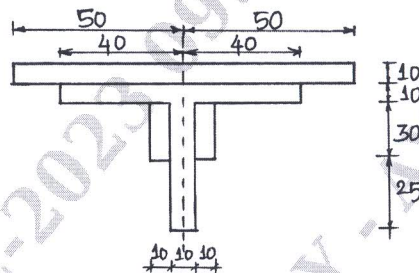


Fig.Q7(c)

(08 Marks)

OR

- 8 a. Derive the equation for Moment of Inertia of a Quadrant from First Principles. (08 Marks)
 b. Determine the Centroid of the shaded area as shown in the Fig.Q8(b).

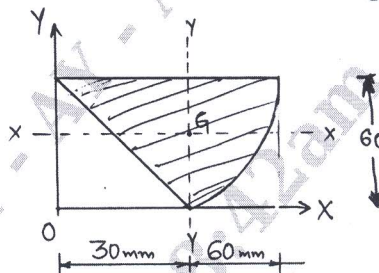


Fig.Q8(b)

(08 Marks)

Module-5

- 9 a. Derive relations for the following :
 (i) Time of flight
 (ii) Horizontal Range
 (iii) Maximum height attained by a projectile (08 Marks)
 b. Determine the position at which the ball is thrown up the plane will strike the inclined plane as shown in the Fig.Q9(b). The initial velocity is 30 m/s and angle of projection is $\tan^{-1}(4/3)$ with horizontal.

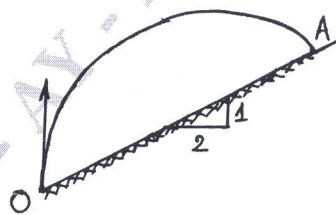


Fig.Q9(b)

(08 Marks)

OR

- 10 a. A wagon has to negotiate a curve of radius 1000m. The mass of the wagon is 5000 kg. Find the safe speed of the train, if the outer rail is raised over the inner rail by 18mm and the distance between the rails is 1m. (04 Marks)
 b. The motion of a particle is defined by the relation $x = t^3 - 9t^2 + 24t - 6$. Determine the position, velocity and acceleration when $t = 5s$. (06 Marks)

- c. A stone is dropped from the top of the tower 50m high. At the same time, another stone is thrown up from the foot of the tower with a velocity of 25 m/s. At what distance from the top and after how much time the two stones cross each other. [Refer Fig.Q10(c)]

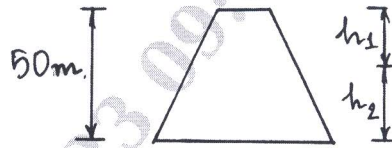


Fig.Q10(c)

(06 Marks)
