Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 51616

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Second Semester

Civil Engineering

ME 2151/ME 25/080120002/CE 1151/10122 ME 205 — ENGINEERING MECHANICS

(Common to Aeronautical, Automobile, Marine, Mechanical, Production, Chemical, Petroleum Engineering, Biotechnology, Polymer, Textile, Textile (Fashion), Plastic Technology, Materials Science and Engineering, Manufacturing Engineering, Mechatronics Engineering, Industrial Engineering, Industrial Engineering and Management, Environmental Engineering, Geoinformatics, Mechanical and Automation Engineering, Petrochemical Engineering, Chemical and Electrochemical Engineering, Petrochemical Technology, Pharmaceutical Technology, Textile Chemistry and Mechanical Engineering (Sandwich))

(Regulation 2008/2010)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Find the length of the line joining the origin with a point $(2,1,-2)$.

2. Find the magnitude and location of the single equivalent force of the system shown in Fig.2.
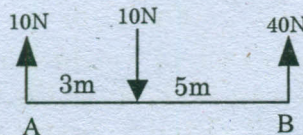

Fig.2.

3. State polygon law of equilibrium

4. State the different types of supports.

5. Define first moment of an area about an axis.

6. What is the radius of gyration of a circle of diameter d about its diameter?

7. A stone is dropped from the top of a tower. It strikes the ground after four seconds. Find the height of the tower.

8. State the principle of work and energy.

9. Define coefficient of static friction.

10. A body is rotating with an initial angular velocity of 3 rad/s. Its angular velocity increases to 10 rad/s in 5 seconds. Find the angular acceleration of the body.

11. (a) A beam is loaded as shown in Fig .11 (a). Find the magnitude, direction and the location of the resultant of the system of forces.
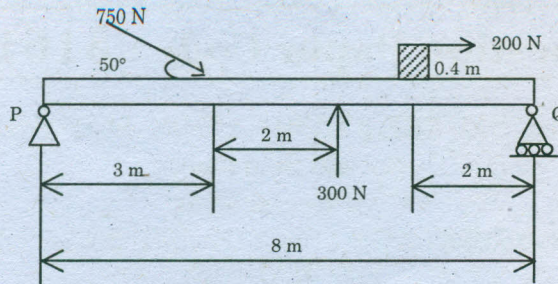

Fig. 11(a)

Or

(b) A system of forces acts as shown in Fig.11(b). Find the magnitude of A and B so that the resultant of the force system passes through P and Q.
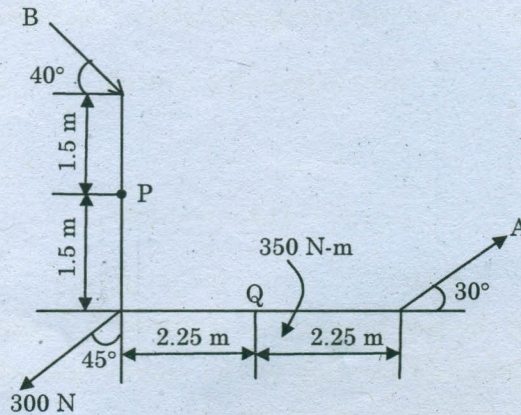

Fig. 11(b)

12. (a) Two identical rollers each of weight 2.5 kN rest in between an inclined wall and a vertical wall as shown in Fig.12(a). Determine the reactions at the points of contact P, Q and R. Assume the wall surfaces to be smooth.
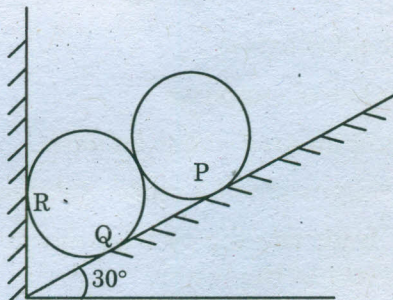

Fig. 12(a)

Or

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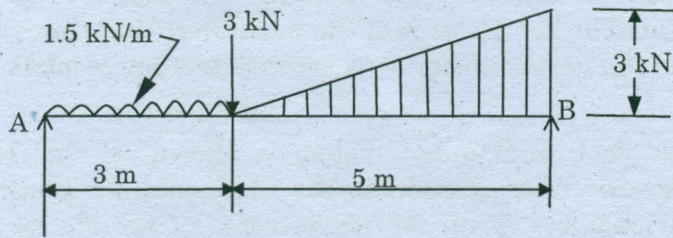(b) Determine the support reactions of the simply supported beam shown in Fig. 12 (b).

Fig.12(b)

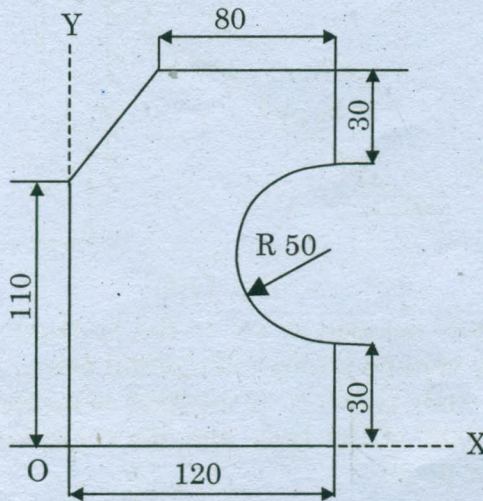13. (a) Locate the centroid of the area shown in Fig. 13(a). The dimensions are in mm.

Fig. 13(a)

Or

(b) Find the moment of inertia of the built up section shown in Fig.13(b) about the axis passing through the centre of gravity parallel to the top flange plate.
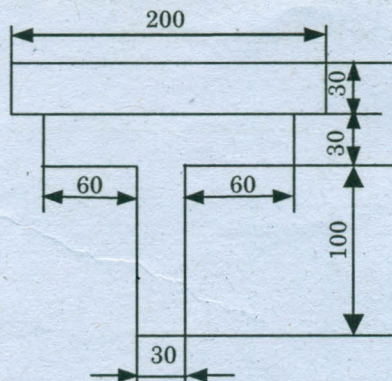

Fig. 13(b)

14. (a) The motion of a particle moving along a straight line is expressed as $s = t^3 - 8t^2 - 3t + 15$. Find (i) the time at which the velocity of the particle will be zero. (ii) the distance travelled by the particle at that time (iii) The acceleration of the particle at that time (iv) the net displacement of the particle from $t = 2$ seconds to $t = 4$ seconds.

Or

(b) A block and pulley system is shown in Fig. 14(b). The coefficient of kinetic friction between the block and the plane is 0.25. The pulley is frictionless. Find the acceleration of the blocks and the tension in the string when the system is just released. Also find the time required for 100 kg block to come down by 2 m.
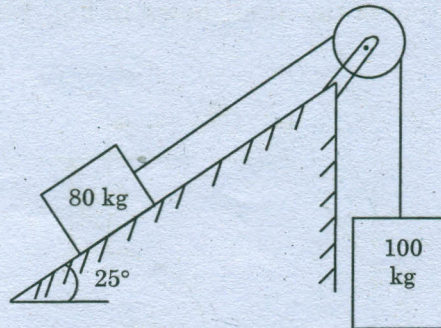

Fig. 14(b)

15. (a) A pull of 250N inclined at 25° to the horizontal plane is required just to move a body kept on a rough horizontal plane. But the push required just to move the body is 300 N. If the push is inclined at 25° to the horizontal, find the weight of the body and the coefficient of friction between the body and the plane.

Or

(b) Two wheel rims P and Q weighing 90N and 150 N respectively are released from rest to roll down an inclined plane simultaneously. The plane is inclined at 30° to the horizontal. The external radii of the rims P and Q and 80 mm and 120 mm respectively. Their radii of gyration are 100 mm and 120 mm respectively. Assuming rolling with slipping, find the relative acceleration of P with respect to Q parallel to the plane. Also find the velocity of P after 4 seconds.

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