(b) Find the centroid of the lamina shown in fig. 13(b). (16)

All dimensions are in cm.

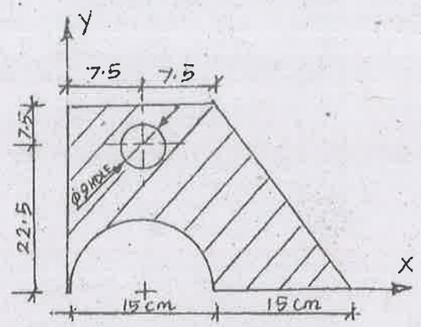

Fig. 13(b)

14. (a) A stone is thrown vertically upwards with a velocity of 19.6 m/s from the top of a tower 24.5 m high. Calculate,

(i) Time required for the stone to reach the ground

(ii) Velocity of the stone in its downward travel at the point in the same level as the point of projection

(iii) The maximum height to which the stone will rise in flight. (16)

Or

(b) A 50 N block is released from rest on an inclined plane making an angle of 35° to the horizontal. The block starts from A slides down a distance of 1.2 m and strikes a spring with a stiffness of 8 kN/m. The μ between block and plane is 0.25. Determine

(i) The amount the spring gets compressed and

(ii) Distance the block will rebound up the plane from the compressed position. (16)

15. (a) A ladder of weight 390 N and 6 m long is placed against a wall at an angle of 30° with respect to wall. The μ between the ladder and the wall is 0.25 and that between ladder and floor is 0.38. Find how high a man of weight 1770 N ascend, before the ladder begins to slip. (16)

Or

(b) A block over lying a 10° wedge on a horizontal floor and leaning against a vertical wall and weighing 1500 N is to be raised by applying a horizontal force to the wedge. Assuming co-efficient of friction between all the surfaces in contact to be 0.3, determine the minimum horizontal force to be applied to raise the block. (16)

08/12/18

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 20631

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Second Semester

Mechanical Engineering

GE 6253 — ENGINEERING MECHANICS

(Common to All Branches)

(Regulations 2013)

(Also common to : PTGE 6253 – Engineering Mechanics for B.E. (Part-Time) First Semester – Mechanical Engineering Regulations – 2014)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish particle and rigid body.

2. State the principle of transmissibility of force with simple sketch.

3. When is moment of force zero about a line?

4. Write the equilibrium equations of a rigid body in 2D.

5. State pappus-guldinus theorem for finding surface area.

6. Differentiate centroid and centre of gravity.

7. Define instantaneous centre of rotation.

8. Define co-efficient of restitution.

9. What is uniform motion?

10. Why kinetic friction is lesser than static friction?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Four coplanar forces are acting at a point. Three forces have magnitude of 20 N, 50 N and 20 N at angles of 45°, 200° and 270° respectively with respect to $+x$ axis. Fourth force is unknown. Resultant force has a magnitude of 50 N and acts along x-axis at an angle of 0° with respect to $+x$ axis. Determine the unknown force and its direction or angle from $+x$-axis. (8)

(ii) A lamp of mass 1 kg is hung from the ceiling by a chain and is pulled aside by a horizontal chord until the chain makes an angle of 60° with the ceiling. Find the tension in the chain and chord. (8)

Or

(b) A 200 kg cylinder is hung by means of two cables AB and AC, which are attached to the top of a wall. A horizontal force P perpendicular to the wall holds the cylinder in the position shown. Determine the magnitude of P and the tension in each cable. (16)

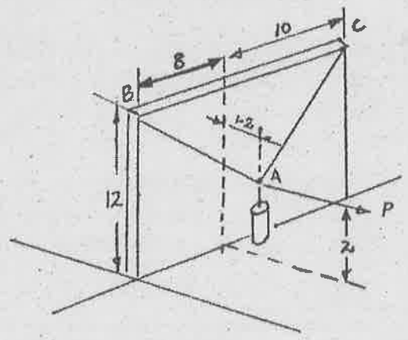

Fig. 11(b)

12. (a) (i) A bar ABCD is hinged at A and supported by a cable, at BC, passing over a frictionless pulley at P above it. Determine the tension in the cable and the reaction at A for a load of 500 N hanging at D. (8)

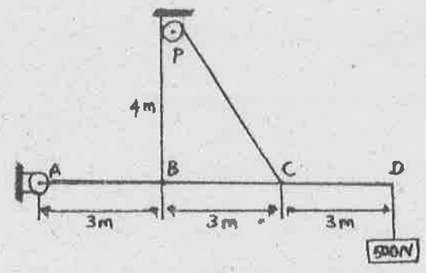

Fig. 12(a)(i)

(ii) Three forces are applied to an angle bracket as shown in Fig. 12(a)(ii). Determine the magnitude and direction of the resultant and the distance from 'O' to the line of action of the resultant. (8)

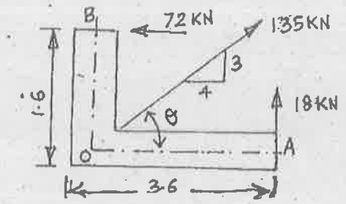

Fig. 12(a)(ii)

Or

(b) The boom of a crane is shown in Fig. 12(b). If the weight of the boom is negligible compared with the load W = 60 kN, find the compression in the boom and also the limiting value of the tension T when the boom approaches the vertical position. (16)

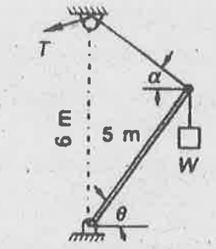

Fig. 12(b)

13. (a) Determine the polar moment of inertia about centroidal axis of the I-section shown in the Fig. 13(a). Also determine the radii of gyration with respect to x–x and y–y axis. (16)

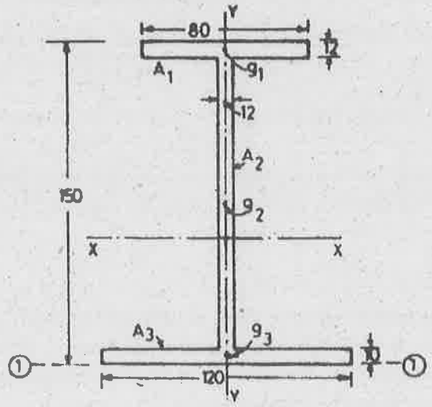

Fig. 13(a)

Or