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

# Q 2278

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

First Semester

Civil Engineering

GE 131 — ENGINEERING MECHANICS

(Common to all branches except Marine Engineering)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Explain principle of transmissibility and state its significance.

2. State the necessary and sufficient conditions for equilibrium of a particle in two dimensions.

3. The number of reactions in a roller support is ———— and that in a fixed support is ————.

4. What is a free body diagram? Explain the need of free body diagrams.

5. The moment of inertia of a right triangle of width 60 mm and height 90 mm about its base is ———— and about its horizontal centroidal axis is ————.

6. Give the expression for finding mass moment of inertia of a body.

7. Give the causes of rolling resistance.

8. Write the relation between the tension in the pulling part of a belt and the resisting part of a belt.

9. State the principle of work and energy.

10. What do you mean by general plane motion?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Determine the magnitude and direction of the resultant of forces acting on the hook shown in Fig. 1. (8)

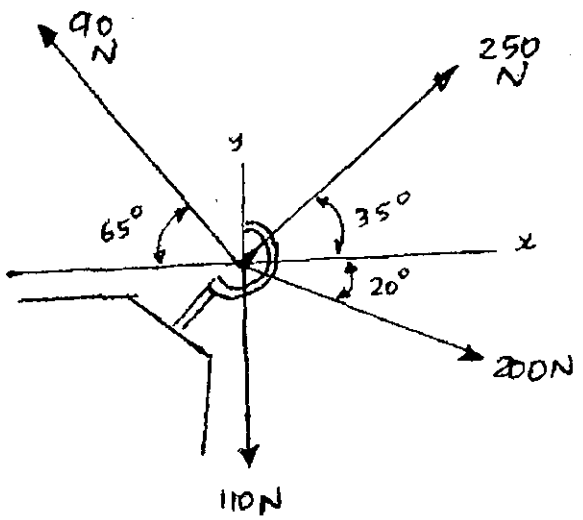


Fig. 1 Qn. 11(a) (i)

(ii) Examine the equilibrium conditions for the particle A shown in Fig. 2. (8)

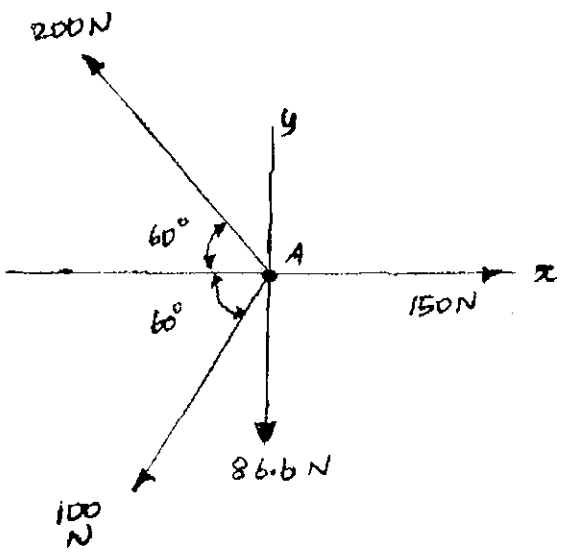


Fig. 2 Qn. 11(a) (ii)

Or

(b) Determine the tension in the cables AB, AC and AD if the crate shown in Fig. 3 is weighing 10 kg.

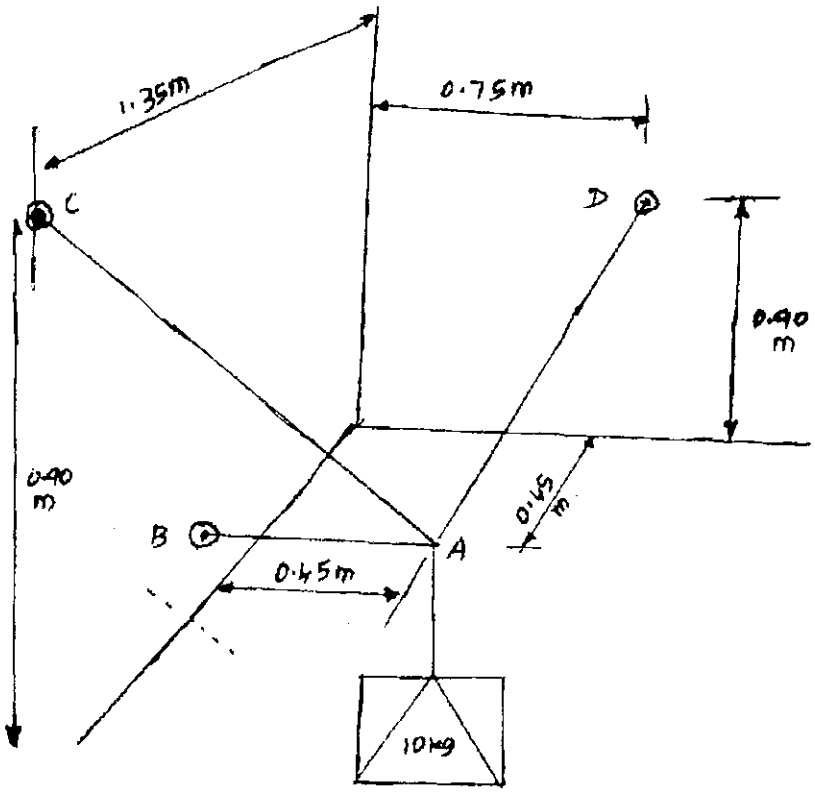


Fig. 3 Qn. 11(b)

12. (a) A precast concrete post weighing 50 kg and of length 6 m shown in Fig. 4 is raised for placing it in position by pulling the rope attached to it. Determine the tension in the rope and reaction at A.

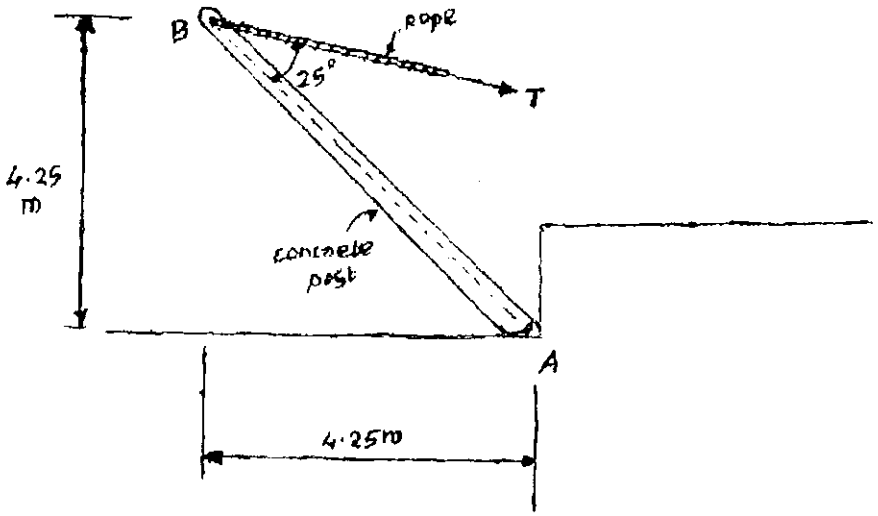


Fig. 4 Qn. 12 (a)

Or

(b) Determine the tension in the cables AB and AC and the reactions at the ball and socket joint O for the concrete pole shown in Fig. 5.

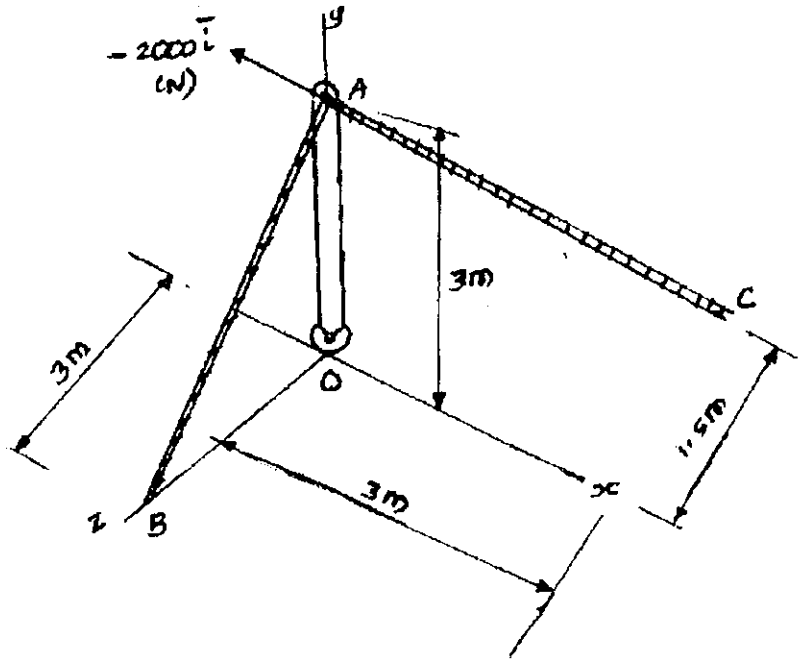


Fig. 5 Qn. 12 (b)

13. (a) Determine the moment of inertia about the centroidal axes for the section shown in Fig. 6. Also, determine the radii of gyration about the centroidal axes.

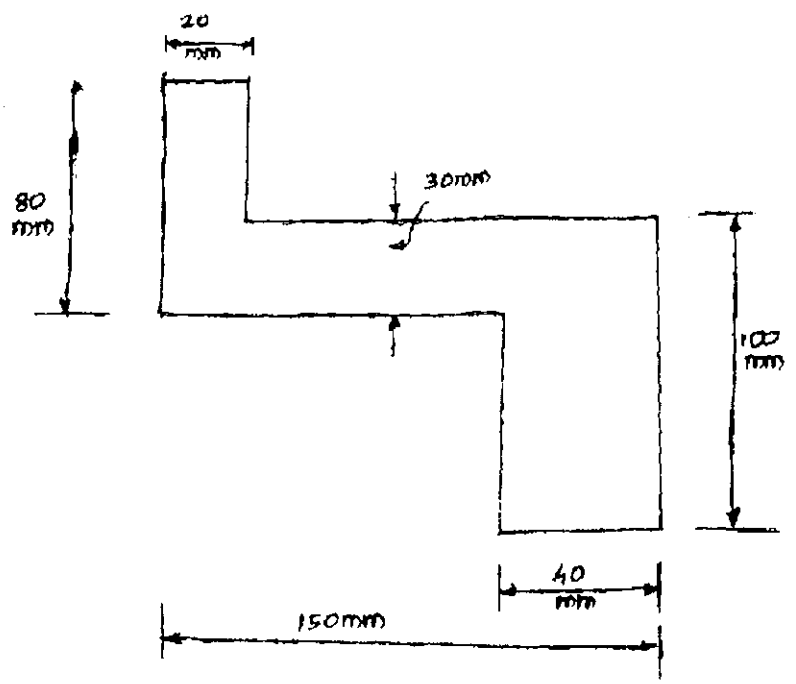


Fig. 6 Qn. 13 (a)

Or

(b) Determine the principal moments of inertia and locate the principal axes for the angle section shown in Fig. 7.

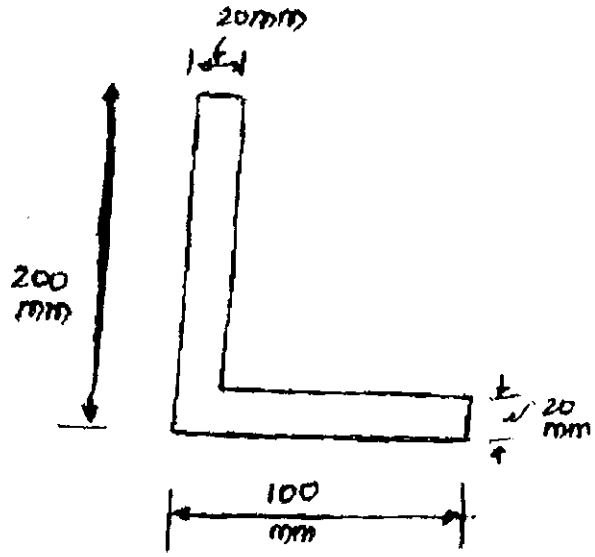


Fig. 7 Qn. 13(b)

14. (a) If a 70 kg block shown in Fig. 8 is released from rest at A, determine its speed after it slides 10 m down the plane. Take the coefficient of friction as 0.3. Use the principle of work and energy.

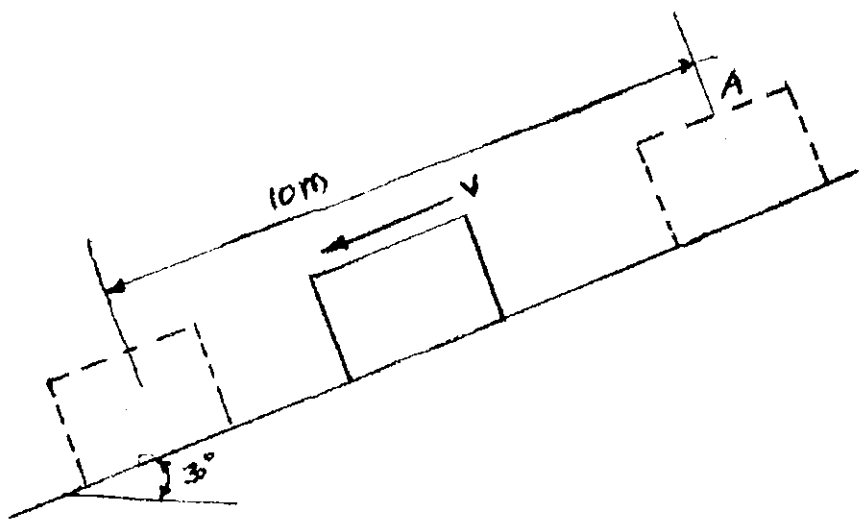


Fig. 8 Qn. 14 (a)

Or

(b) A 100 g cricket ball has a velocity of 20 m/s before being struck by the bat. After the impact, the ball moves in the direction shown in Fig. 9 with a velocity of 25 m/s. If the bat and ball are in contact for 0.01 seconds, determine the average impulsive force exerted on the ball during impact.

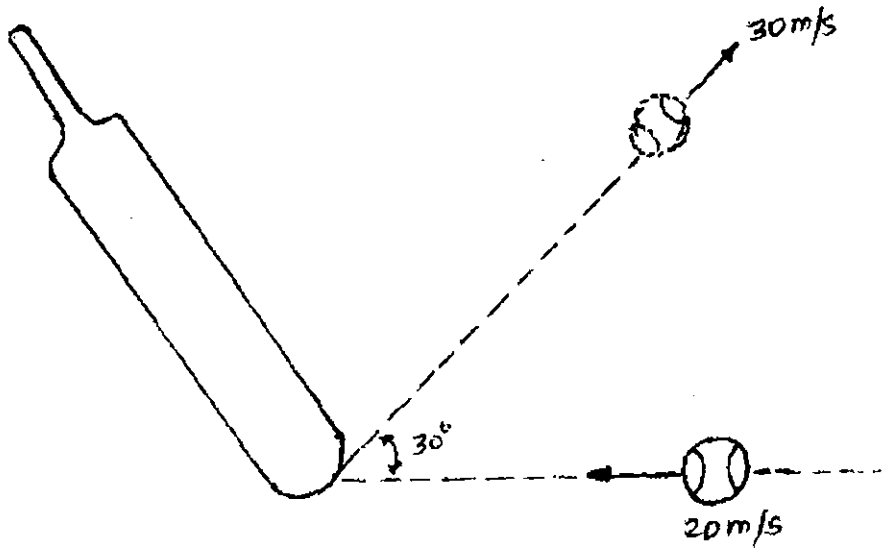


Fig. 9 Qn. 14 (b)

15. (a) Determine the acceleration of the 400 kg block shown in Fig. 10 if the coefficient of kinetic friction between the block and the horizontal surface is 0.25. Also, find the reactions at the points A and B shown.

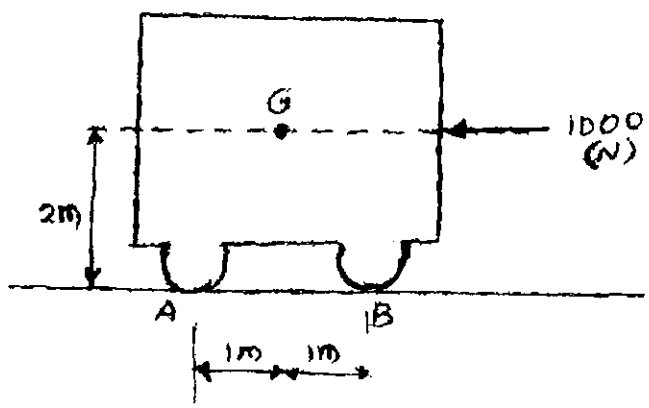


Fig. 10 Qn. 15 (a)

Or

(b) The 15 kg slender rod shown in Fig. 11 is subjected to a moment of 5 N–m at A as shown in Fig. 11. The rod has an angular velocity of 3 rad/s at the position shown. Determine the reactions at Pin A at this instant.

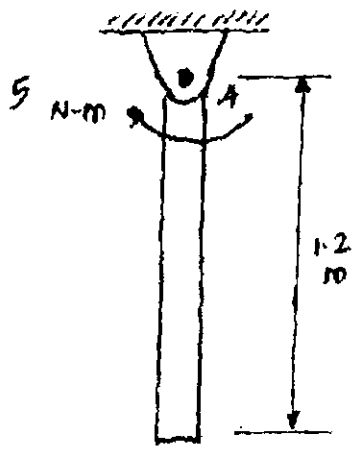


Fig. 11 Qn. 15 (b)