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**T 3920**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2008.

Annual Pattern — First Year

(Regulation 2004)

Civil Engineering

GEIX 04 — ENGINEERING MECHANICS

(Common to Food Technology/Bio-Technology/Chemical Engineering/  
Petroleum Engineering/Polymer Technology/ Textile Technology/  
Textile Technology (Textile Chemistry))

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between space diagram and free-body diagram.
2. State the necessary and sufficient conditions for equilibrium of a particle in space.
3. Express the rectangular components of the moment of a force in space.
4. How will you find moment of a force about a given axis in three dimensions?
5. Give the causes of rolling resistance.
6. How can the analysis of wedges be made simple?
7. Express polar moment of inertia of a circular section.
8. State parallel axis theorem as applied to mass moments of inertia.
9. Write down the expression for acceleration of a particle moving along a circle of radius 'r'.
10. State the principle of conservation of linear momentum.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Determine the magnitude and direction of the resultant of the two forces acting on the bolt shown in Fig. 1. (6)

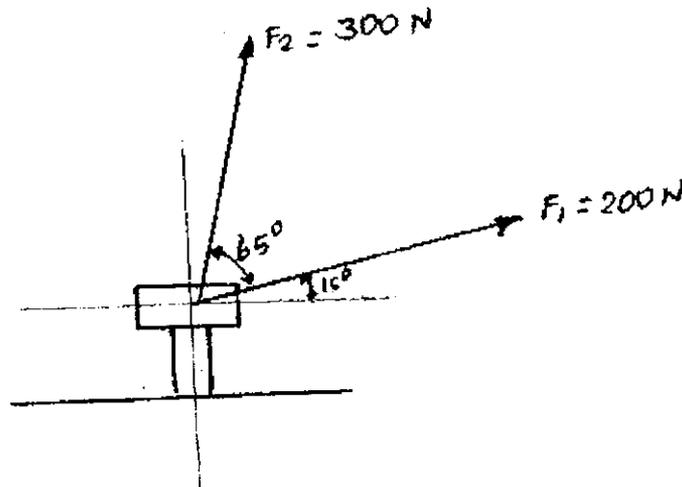


Fig.1

- (ii) Determine the magnitude and direction of force  $F$  shown in Fig.2 so that the particle  $A$  is in equilibrium. (10)

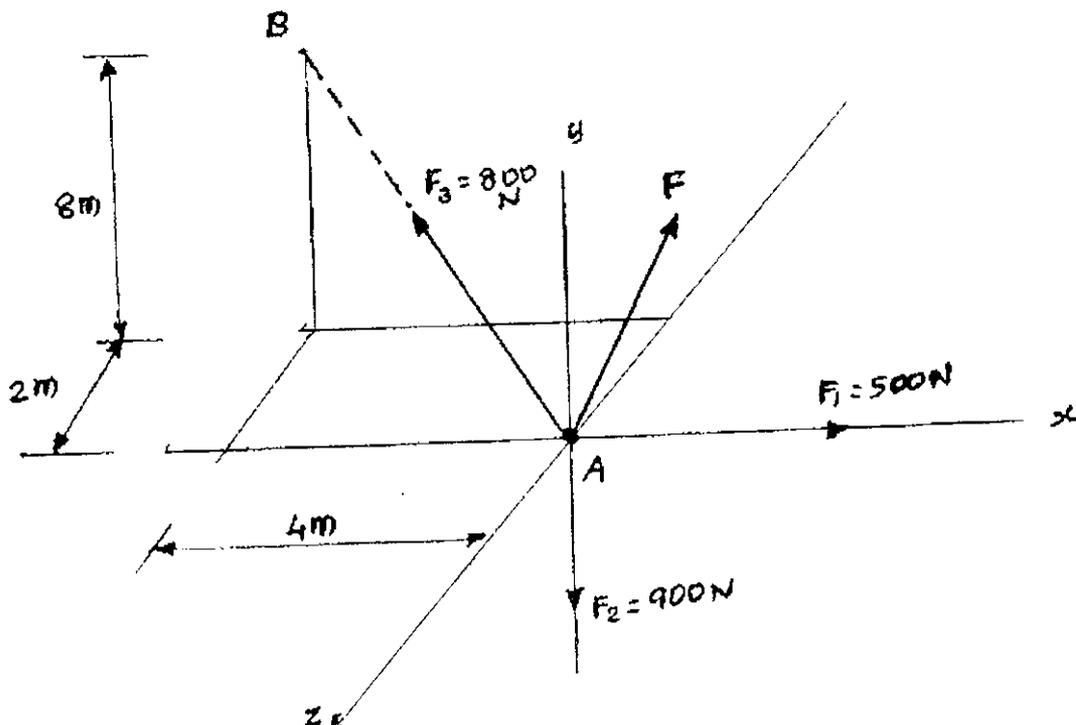


Fig. 2

Or

- (b) (i) Describe the methods of finding resultant of several concurrent forces. (8)
- (ii) Determine the magnitude and direction of the resultant of the forces acting on the hook shown in Fig.3. (8)

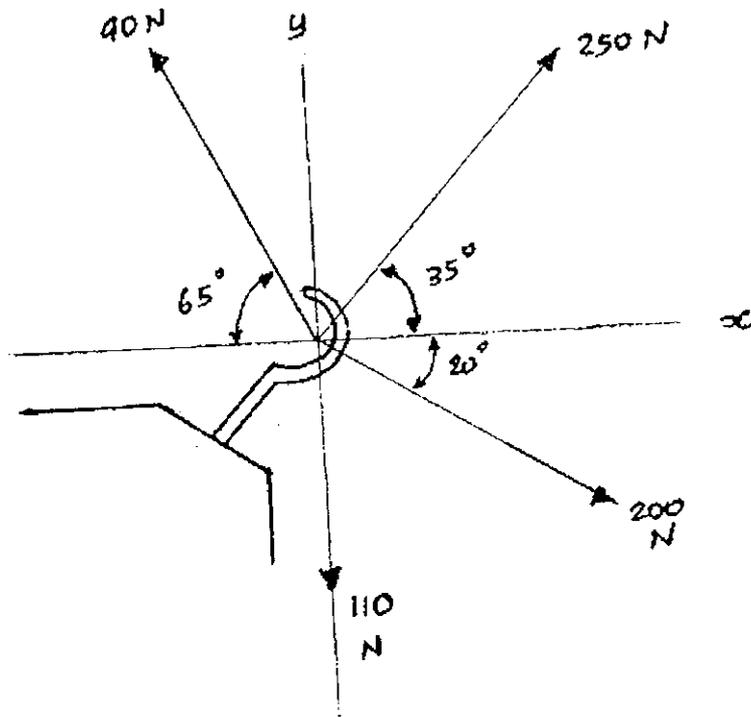


Fig.3

12. (a) Determine the forces in the members of the pin jointed truss shown in Fig.4.

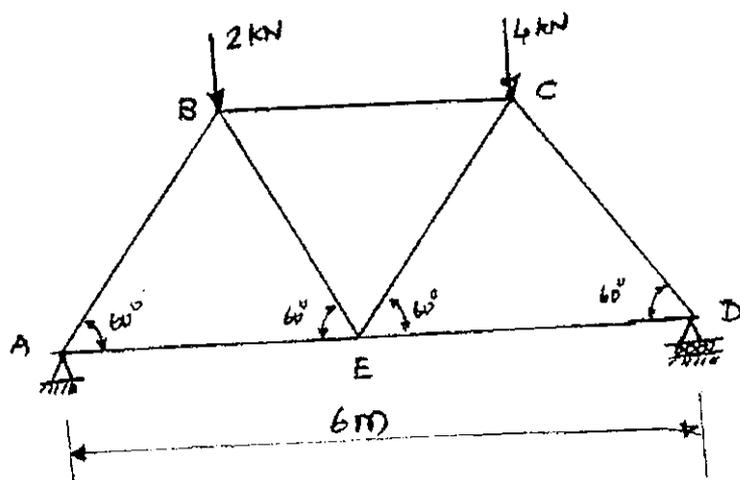


Fig. 4.

Or



- (b) Determine the maximum and minimum values of  $m_w$  so that the 200kg block shown in Fig.7 will neither start moving up the  $20^\circ$  incline nor slip down the incline. Take the coefficient of static friction for the contact surfaces as 0.30.

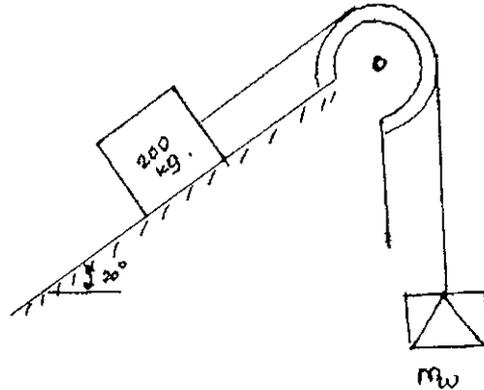


Fig. 7

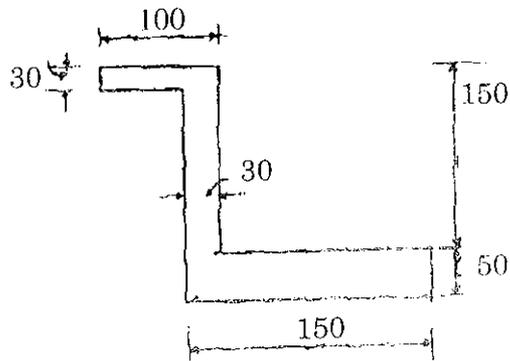
14. (a) An I section is having the following dimensions. Compute the moments of inertia about horizontal and vertical centroidal axes. Also, determine the polar moment of inertia of the section.

Top flange	:	100 mm $\times$ 20mm
Web	:	25mm $\times$ 200 mm
Bottom flange	:	200mm $\times$ 25mm

The section is symmetric with respect to vertical centroidal axis.

Or

- (b) Determine the moments of inertia of the section shown in Fig.8 about centroidal axes. Also, determine the radii of gyration about the centroidal axes.



All dimensions are in mm.

Fig. 8

15. (a) The 50kg block shown in Fig.9 rests on a horizontal plane for which the coefficient of kinetic friction is 0.3. If the block is pulled by a 350N force as shown, determine the velocity of the block after it has moved 65m starting from rest. Use the principle of work and energy.

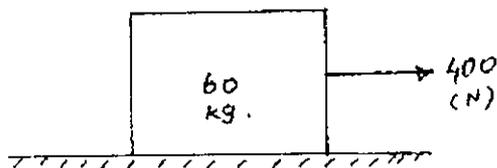


Fig. 9

Or

- (b) A ball is thrown vertically upward from a point located 15m above the ground. The maximum height reached by the ball is 25m from the ground. Determine the initial velocity of the ball at 15m above the ground and also the velocity with which the ball strikes the ground. Use principle of conservation of energy.