

Roll No:.....

National Institute of Technology Delhi
Name of the Examination: B. Tech. Make Up (July 2018)

Branch: CSE/EEE/ECE
Title of the Course: Engineering Mechanics

Semester: I/II
Course Code: MEL 102

Time: 3 Hours
Note: Use of calculator is permitted

Maximum Marks: 50

Section I (1 Mark Each Question)

Q. 1. Answer following questions:

- (i) Explain the term continuum & rigid body.
- (ii) State the Lami's theorem.
- (iii) What do you understand by moment of a force.
- (iv) What is coefficient of friction.
- (v) Define the term force.
- (vi) State Newton's second law of motion.
- (vii) Define resultant force.
- (viii) Write the formulae for Lami's theorem.
- (ix) Define polar moment of inertia.
- (x) What do you understand by virtual work.

Section II (5 Marks Each Question, Attempt any 4)

Q. 2. If a stone falls passed a window of 2.45 m height in half a second, find the height from which the stone fell.

Q. 3. The two forces **P** and **Q** act on a bolt **A** as shown in Fig (a). Determine their resultant.

Q. 4. Four forces act on bolt **A** as shown in Fig (b). Determine the resultant of the forces on the bolt.

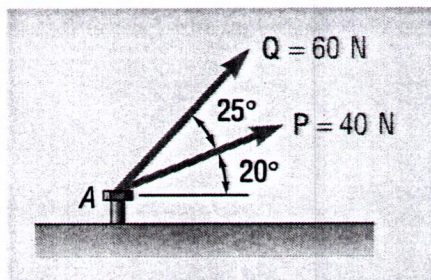


Fig. (a)

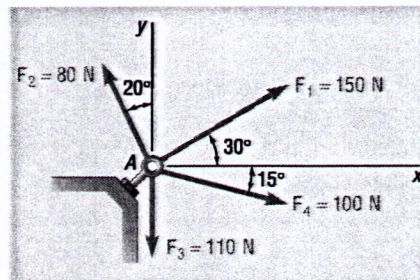


Fig. (b)

Q. 5. Two forces of the same magnitude **P** act on a cube of side **a** as shown in Fig (c). Replace the two forces by an equivalent wrench, and determine (i) the magnitude and

direction of the resultant force \mathbf{R} , (ii) the pitch of the wrench, (iii) the point where the axis of the wrench intersects the yz plane.

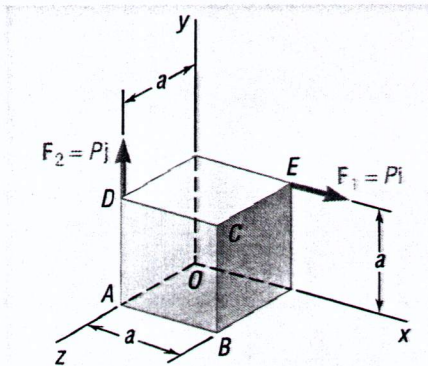


Fig. (c)

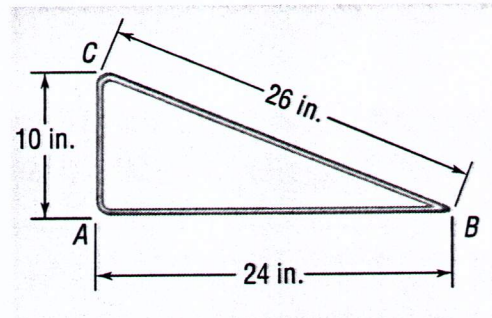


Fig. (d)

Q. 6. The figure shown is made from a piece of thin, homogeneous wire (Fig. (d)). Determine the location of its center of gravity.

Section III (10 Marks Each Question, Attempt any 2)

Q. 7. A ball is tossed with a velocity of 10 m/s directed vertically upward from a window located 20 m above the ground. Knowing that the acceleration of the ball is constant and equal to 9.81 m/s^2 downward, determine the velocity v and elevation y of the ball above the ground at any time t , the highest elevation reached by the ball and the corresponding value of t , the time when the ball will hit the ground and the corresponding velocity. Draw the $v-t$ and $y-t$ curves.

Q. 8. Using the method of joints, determine the force in each member of the truss shown in Fig (e).

Q. 9. Using the parallel-axis theorem, determine the product of inertia of the area shown with respect to the centroidal x - and y - axes (Fig. (f)).

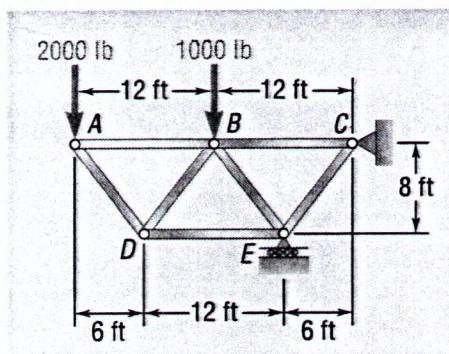


Fig. (e)

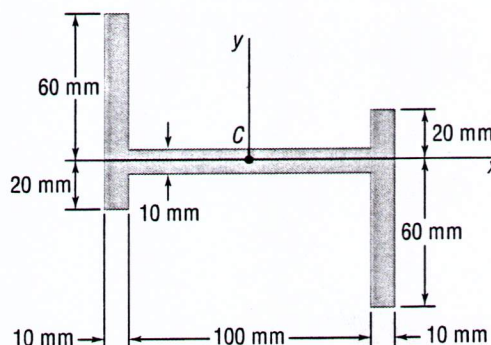


Fig. (f)