

Roll No:.....

National Institute of Technology Delhi

Name of the Examination: B. Tech. End-Semester (Spring 2018)

Branch: ECE/EEE

Semester: II

Title of the Course: Engineering Mechanics

Course Code: MEL 102

Time: 3 Hours

Maximum Marks: 50

Note: Use of calculator is permitted

Section I (1 Mark Each Question)

Q. 1. Answer following questions:

- (i) Explain engineering mechanics.
- (ii) Explain mechanics of materials.
- (iii) State Newton's second law of motion.
- (iv) Define the term moment.
- (v) Define the term torque.
- (vi) State Newton's law of gravitation.
- (vii) Define shear force.
- (viii) Write the formulae for Lami's theorem.
- (ix) What is statics.
- (x) What is dynamics.

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

Q. 2. A 4.8 m long beam is subjected to the forces as shown in Fig. (a). Reduce the given system of forces to an equivalent force-couple system at A , an equivalent force-couple system at B , a single force or resultant.

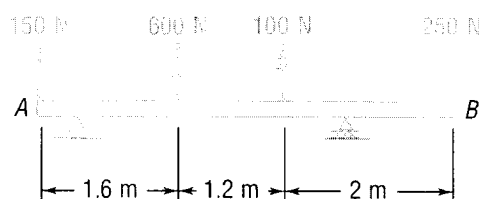


Fig. (a)

Q. 3. A ball is thrown vertically upward from the 12 m level in an elevator shaft with an initial velocity of 18 m/s. At the same instant an open-platform elevator passes the 5 m level, moving upward with a constant velocity of 2 m/s. Determine when and where the ball will hit the elevator and the relative velocity of the ball with respect to the elevator when the ball hits the elevator.

Q. 4. The frame as shown in Fig. (b) supports part of the roof of a small building. Knowing that the tension in the cable is 150 kN, determine the reaction at the fixed end E .

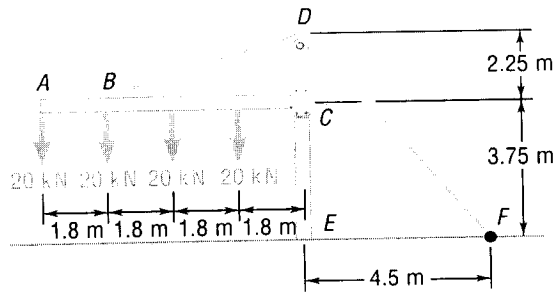


Fig. (b)

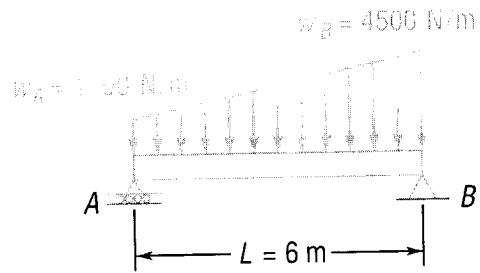


Fig. (c)

Q. 5. A beam supports a distributed load as shown in Fig. (c). Determine the equivalent concentrated load. Determine the reactions at the supports.

Q. 6. A projectile is fired with an initial velocity of 800 ft/s at a target B located 2000 ft above the gun A and at a horizontal distance of 12,000 ft. Neglecting air resistance, determine the value of the firing angle α .

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. Determine the force in members FH, GH, and GI of the roof truss as shown in Fig (d).

Q. 9. Determine by direct integration the location of the centroid of a parabolic spandrel as shown in Fig. (e).

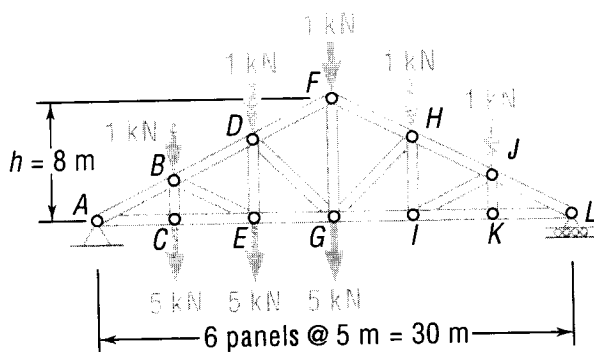


Fig. (d)

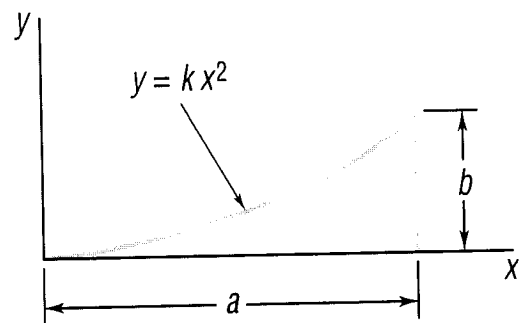


Fig. (e)