

C 60700

(Pages : 4)

Name:

Reg. No.

**COMBINED FIRST AND SECOND SEMESTER B.TECH (ENGINEERING)
DEGREE EXAMINATION, APRIL 2014**

(2009 Scheme)

PTEN/EN 09 105—ENGINEERING MECHANICS

Time : Three Hours

Maximum : 70 Marks

Part A

Answer all questions.

Each question carries 2 marks.

1. Distinguish between Equilibrant and Resultant.
2. Define angle of repose.
3. List any three useful effects of friction.
4. State Pappus-Guldinus theorems.
5. What is Chasle's theorem ?

(5 × 2 = 10 marks)

Part B

Answer any four questions.

Each question carries 5 marks.

6. State the following laws/theorems of mechanics,
 - (a) Theorem of three forces.
 - (b) Law of superposition.
7. State and prove the parallel axis theorem.
8. State Coloumb's Law's of friction.
9. A ball of mass 250 gm is dropped from a height of 4 m on a horizontal floor. The ball rebounds to a height of 1.75 m after the impact. Determine the Coefficient of restitution between the ball and the floor..
10. A ball is thrown vertically upwards with an initial velocity of 18m/sec. Find the (a) time taken to reach the maximum height ; (b) The maximum height ; and (c) the final velocity when it strikes the ground.
11. - Derive the expression for the second moment of area of a rectangular cross-section of a base b and depth d about the centroidal axis parallel to the base.

(4 × 5 = 20 marks)

Turn over

Part C

Answer Section (a) or Section (b).

Each question carries 10 marks.

12. (a) An automobile is pulled by means of two trucks as shown in Figure 1. If the resultant of the two forces acting on the automobile is 25 kN being directed along the positive direction of X-axis, determine the angle θ of the cable attached to the track at B such that the force F_B in this cable is minimum. What is the magnitude of force in each cable when this occurs?

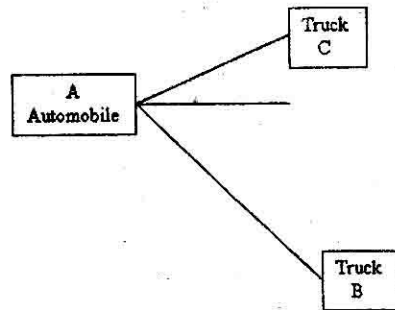


Figure 1

Or

- (b) If the tension in wire 'AB' is 75 kN determine the required values of tensions in 'AC' and 'AD', so that the resultant of the three forces applied at 'A' is vertical as shown in Figure 2. Find also the resultant.

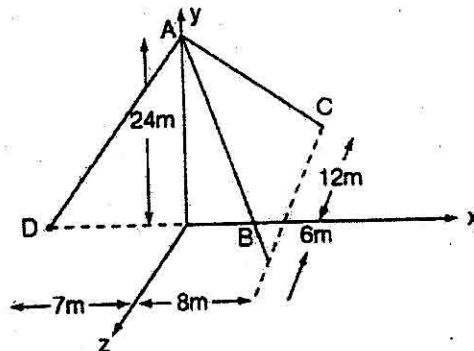
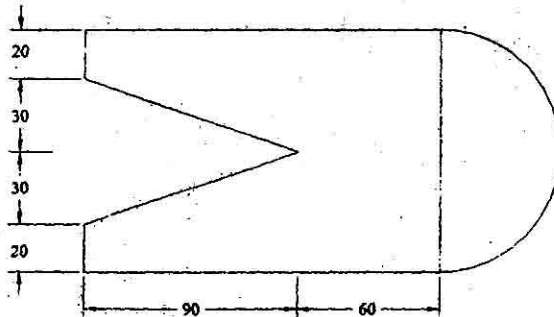


Figure 2

13. (a) An effort of 200 N is required to just move a body up an inclined plane of angle 15° , the forces acting parallel to the plane. If the angle of inclination of the plane is made 20° , the effort required, applied parallel to the plane is found to be 230 N. Find the weight of the body and the coefficient of friction.

Or

- (b) Calculate the moment of inertia of the section shown in Figure 3 about the centroidal axes.



All dimensions are in mm.

Figure 4

14. (a) Draw shear force bending moment diagrams for the simply supported beam shown in Figure 4.

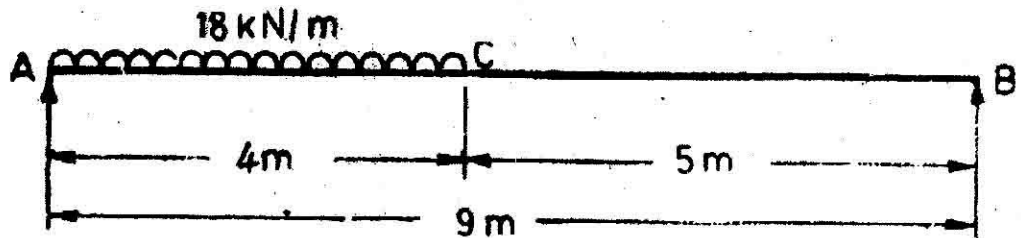


Figure 4

Or

Turn over

- (b) Find the forces in the various members of the frame shown in Figure 5.

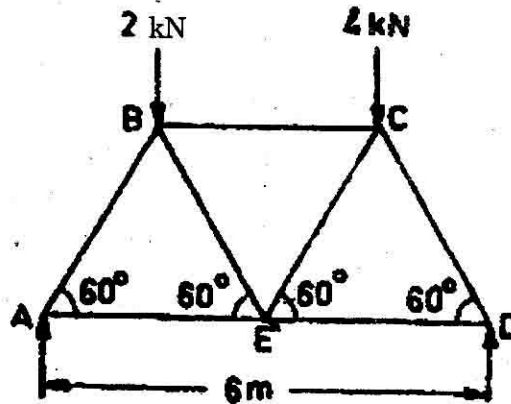


Figure 5

15. (a) Find the power of locomotive drawing a train whose weight is 600 kN up an incline 1 in 100 at a steady speed of 4.5 km/h. Assume frictional resistance to be 8 N per 1000 N.

Or

- (b) A body weighing 196.2 N slides up a 30° inclined plane under the action of an applied force 300 N acting parallel to the inclined plane. The coefficient of friction is 0.2. The body moves from rest. Determine :
- Acceleration of the body.
 - Kinetic energy of the body after 4 seconds.
 - Work done on the body in 4 seconds.
 - Impulse applied in 4 seconds.

(4 × 10 = 40 marks)