

I B. Tech I Semester Supplementary Examinations, November - 2020
ENGINEERING MECHANICS
 (Com. to CE, Auto E, Min E)

Time: 3 hours

Max. Marks: 75

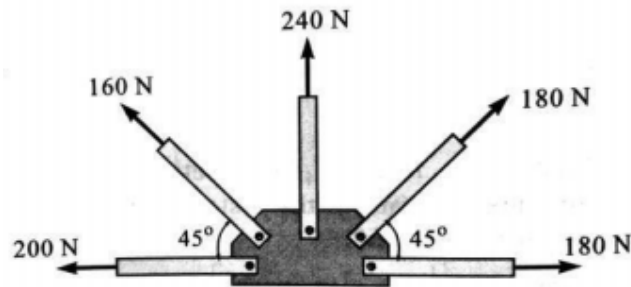
Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

1. a) The following forces act at a point: (8M)
 (i) 20N inclined at 30° towards North of East.
 (ii) 25N towards North
 (iii) 30N towards North West and
 (iv) 35N inclined at 40° towards South of west.
 Find the magnitude and direction of the resultant force.

- b) Explain the types of friction with examples? Explain the difference between coefficient of friction and angle of friction. (7M)

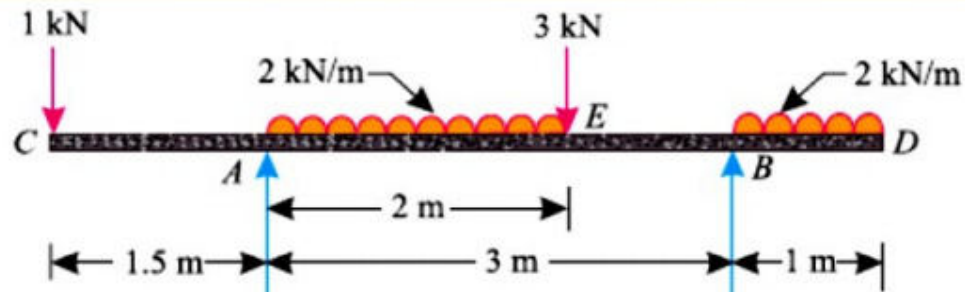
Or

2. a) Define limiting friction and state Coulomb's laws of dry friction. (7M)
 b) A gusset plate of roof truss is subjected to forces as shown in figure. Determine the magnitude of the resultant force and its orientation measured counter clockwise from the positive x-axis. (8M)



Figure

3. a) A beam AB of span 3m, overhanging on both sides is loaded as shown in figure. Determine the reactions at the supports A and B. (10M)

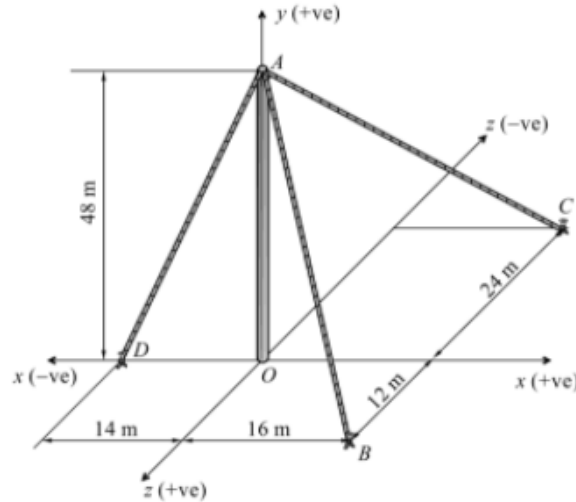


Figure

- b) What is the difference between coplanar concurrent and coplanar non-concurrent set of forces. Give examples on each. (5M)

Or

4. Figure Knowing that the tension in AC is $T_{AC} = 20$ kN. Determine the required values of tension T_{AB} and T_{AD} so that the resultant of the three forces applied at A is vertical and calculate resultant. (15M)

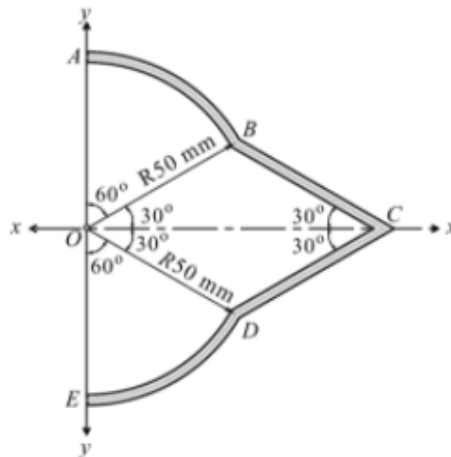


figure

5. a) A ladder 5 meters long rests on a horizontal ground and leans against a smooth vertical wall at an angle 70° with the horizontal. The weight of the ladder is 900 N and acts at its middle. The ladder is at the point of sliding, when a man weighing 750N stands on a rung 1.5 meter from the bottom of the ladder. Calculate the coefficient of friction between the ladder and the floor. (8M)
- b) Distinguish between centroid and center of gravity. Describe the various methods of finding the centre of gravity of a body. (7M)

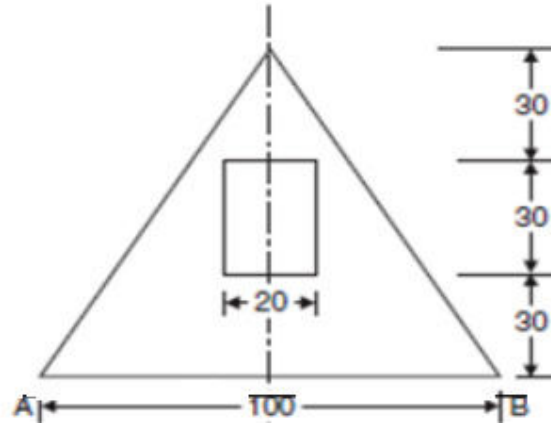
Or

6. a) From the first principle find the centroid of a right angle triangle of height h and breadth b . (5M)
- b) Determine the centre of gravity of the wire ABCDE of uniform weight of 2 kN/m bent as shown in figure. (10M)



Figure

7. a) Find Determine the moment of inertia an area of a triangle with a rectangular cut as shown in figure about the base A-B and the centroidal axis parallel to AB. (8M)
(All dimensions are in Centimetres).

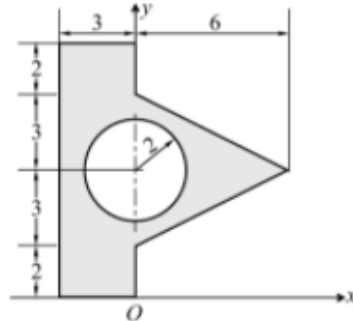


Figure

- b) Derive an expression for moment of inertia of a semicircular section with neat sketch. (7M)

Or

8. a) Determine the polar moment of inertia of the shaded area in figure with respect to and axis through the origin. (8M)



Figure

- b) Find the mass moment of inertia of a solid sphere of radius r and mass m about any axis. (7M)
9. a) A car moves along a straight line whose equation of motion is given by $s = 12t + 3t^2 - 2t^3$, where (s) is in metres and (t) is in seconds. Calculate (i) velocity and acceleration at start, and acceleration, when the velocity is zero. (8M)
- b) How would you find out (i) time of flight (ii) range of a projectile when projected upwards on an inclined plane. (7M)

Or

10. a) A bullet of mass 75 gm is fired into a freely suspended target of mass 7 kg. On impact, the target moves with a velocity of 10 m/s along with the bullet in the direction of firing. Find the velocity of bullet. (7M)
- b) Define angular displacement, angular velocity and angular acceleration. Write governing equations of velocity and acceleration of rigid body motion. (8M)