Somaiya Vidyavihar University
K. J. Somaiya College of Engineering, Mumbai -77
(A Constituent College of Somaiya Vidyavihar University)
DEPARTMENT OF MECHANICAL ENGINEERING

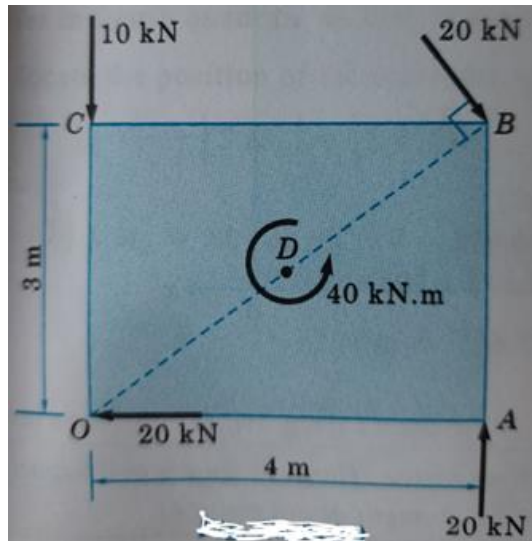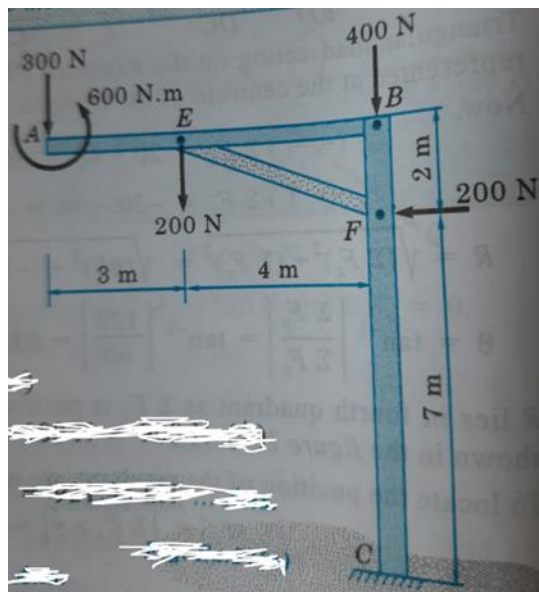Engineering Mechanics   Jan – May 2024

Engineering Mechanics Problems

1. Find the resultant of the force system acting on a body OABC as shown in the fig. Also find the point where the resultant will cut x and y-axis. What is the distance of resultant from point O?


2. A frame is loaded as shown in fig. (a) Determine the magnitude; direction and line of action the equilibriant w.r.t. member AB measured from point A. (b) Also replace the loading on the frame by a resultant force and couple at point C.

Somaiya Vidyavihar University
K. J. Somaiya College of Engineering, Mumbai -77
(A Constituent College of Somaiya Vidyavihar University)
DEPARTMENT OF MECHANICAL ENGINEERING

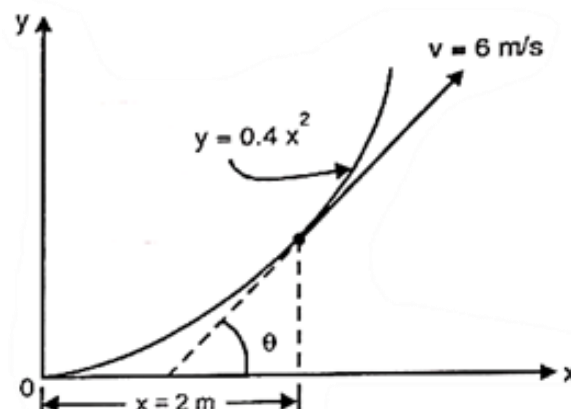Engineering Mechanics   Jan – May 2024

3.

A rectangular parallelpiped carries three forces as shown. Reduce the force system to a resultant force applied at origin and a moment around the origin.
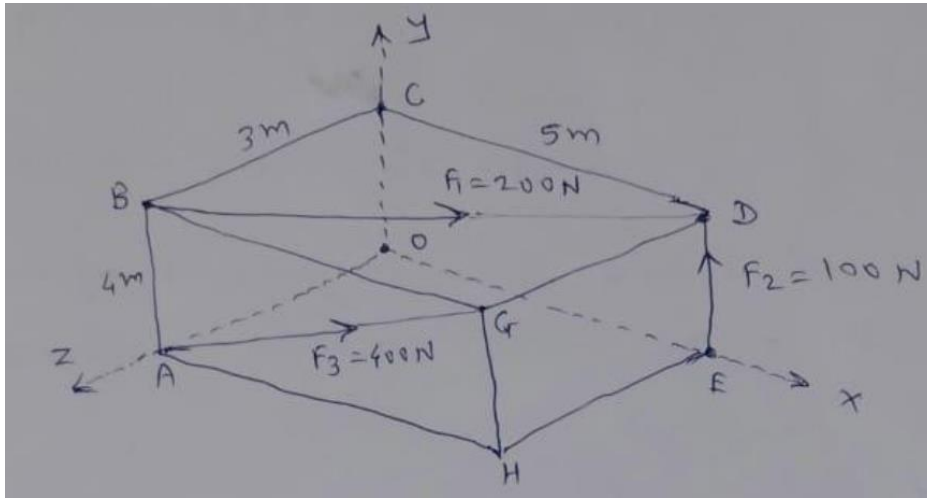
4. Motion of a particle along a straight line is defined by $V^3 = 64s^2$, where v is in m/s and s is in m. Determine:
   a) Velocity when distance covered is 8 m.
   b) Acceleration when distance covered is 27 m.
   c) Acceleration when velocity is 9m/s.

5. A point moves along a curved path **y=0.4x²**. At x=2 m, its speed is 6 m/s increasing at 3 m/s². At this instant find the a) Velocity components in x and y direction, b) its acceleration.
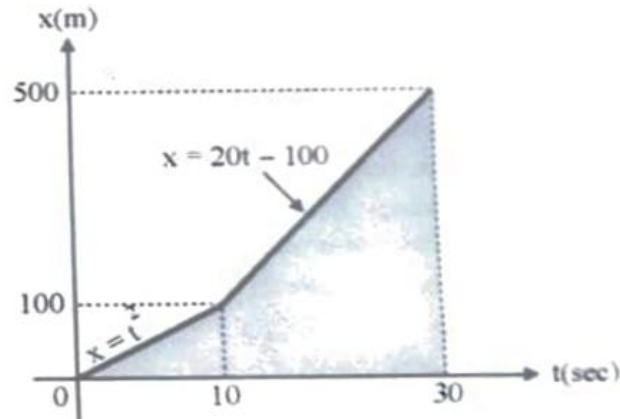
Somaiya Vidyavihar University
K. J. Somaiya College of Engineering, Mumbai -77
(A Constituent College of Somaiya Vidyavihar University)
DEPARTMENT OF MECHANICAL ENGINEERING
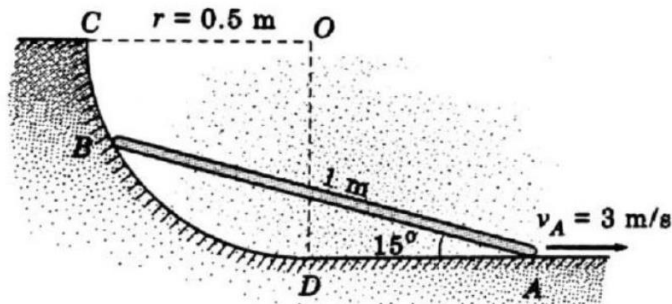
Engineering Mechanics   Jan – May 2024

6. For a car moving along a straight line x-t diagram is shown in Fig. Plot v-t and a-t diagrams for a time period $0 \le t \le 30$ sec.
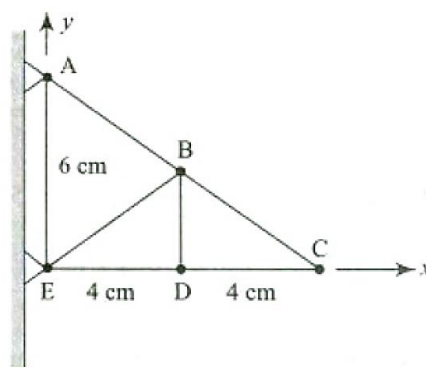

7.

Bar AB is 1 m long. End A of the bar moves with a velocity of 3 m/s on the horizontal plane. End B travels along circular path CD of radius 0.5 m. Find the velocity of B for the given position.
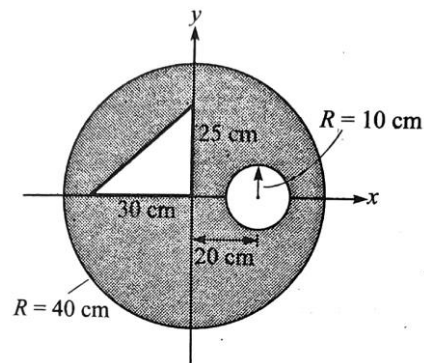

8. Locate the centroid of the plane truss shown in the figure below. Assume all the bars have the same weight per unit length. Assume the length of AB = BC = BE = 5 cm.
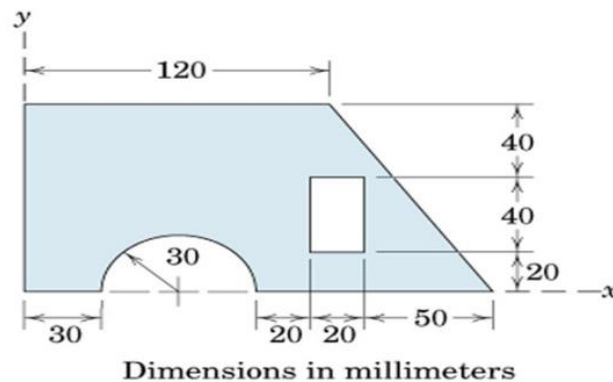
9. Find the centroid of the shaded lamina as shown in figure below.

10. Locate the centroid of the shaded area

Dimensions in millimeters

11. Two beams *AB* and *CD* a r e arranged as shown in Fig. given below. Find the support reactions at *D*.
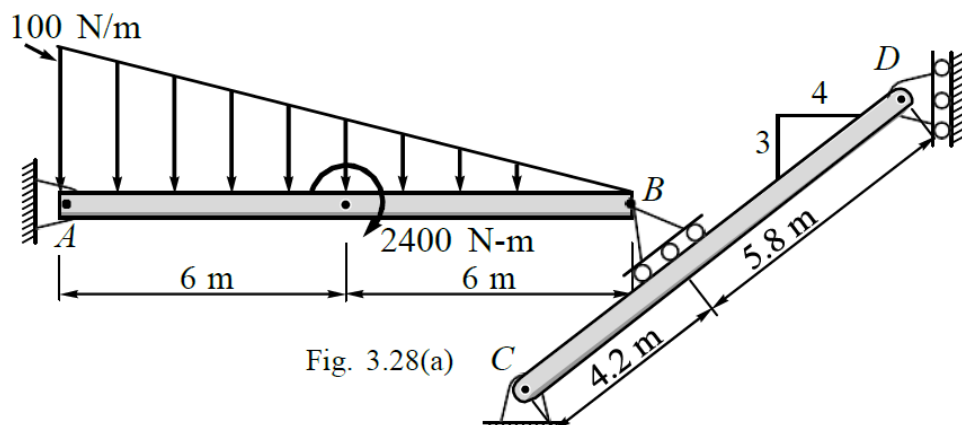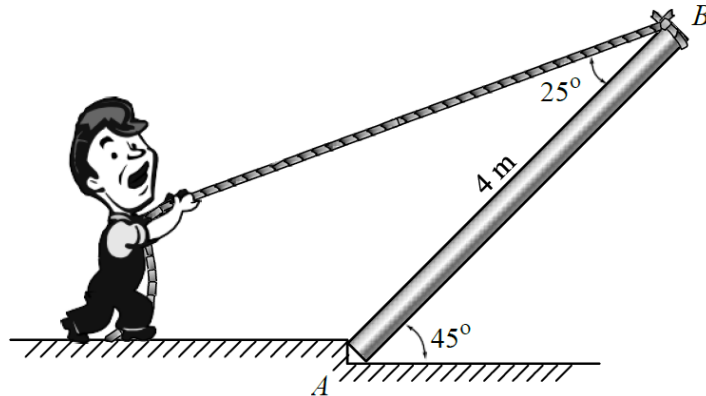

Fig. 3.28(a)   C

Somaiya Vidyavihar University
K. J. Somaiya College of Engineering, Mumbai -77
(A Constituent College of Somaiya Vidyavihar University)
DEPARTMENT OF MECHANICAL ENGINEERING

Engineering Mechanics   Jan – May 2024

12. A mass raises a 10 kg joist of length 4 m by pulling on a rope. Find the tension in the ropeand reaction at *A*. Refer Figure given below.

13. Two spheres, *A* and *B*, are resting in a smooth through as shown in Figure given below. Draw the free body diagrams of *A* and *B* showing all the forces acting on them, both in magnitude and direction. Radius of spheres *A* and *B* are 250 mm and 200 mm, respectively.
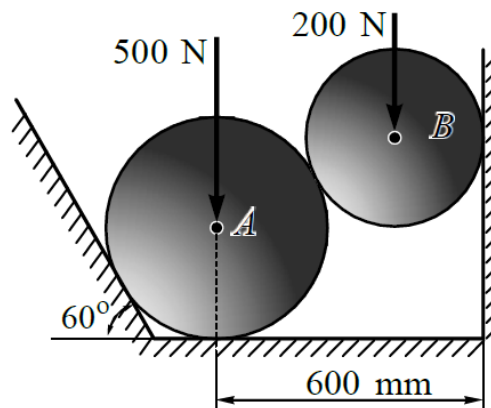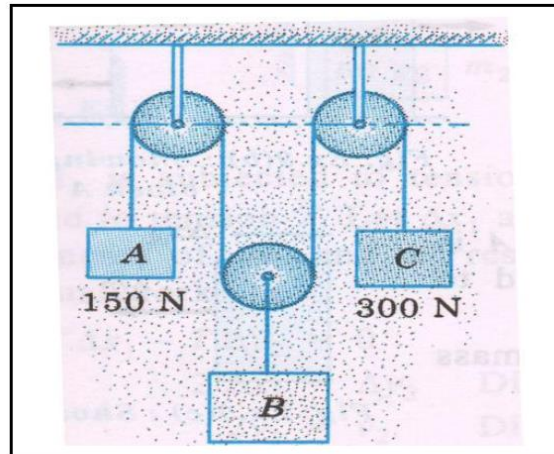
14. A 5 Kg mass drops from 2 meters upon a spring whose modulus is 10 N/mm. What will be the speed of this mass when the spring is deformed by 100 mm?

15.

Three weights A, B and C are connected as shown in figure. Determine the acceleration of each weight and tension in the string.

Given : W_A = 150 N ,
W_B = 450 N and W_C = 300 N.

16.

Two smooth balls of ball 1 of mass 3 kg and ball 2 of mass 4 kg are moving with velocities 25 m/s and 40 m/s respectively at an angle of 30^0 and 60^0 with the vertical as shown in figure. If coefficient of restitution between two balls is 0.8, find the magnitude and direction of velocities of these balls after impact.