

INDIAN INSTITUTE OF ENGINEERING SCIENCE & TECHNOLOGY, SHIBPUR
B.Arch. 1st SEMESTER EXAMINATIONS, 2017

Engineering Mechanics (AM 101A)

Full Marks: 70

Time: 3 hrs

Answer any five questions

1. Determine moment of inertia of the plane figure as shown in Figure Q1 with respect to centroidal x and y axes. All dimensions are in cm.
2. A ladder (Fig. Q2), consisting of two equal parts AB and AC hinged together at A and connected by a horizontal string DE, rests on a smooth horizontal plane by the applied load P. Determine force induced in string DE. The following numerical data are given: $l = 3 \text{ m}$, $a = 2.1 \text{ m}$, $h = 1.5 \text{ m}$, $\alpha = 60^\circ$.
3. Determine the force induced in the bar AB of the simple truss supported and loaded as shown in Fig. Q3.
4. a) Locate the centroid C of the shaded area obtained by cutting a semicircle of diameter a from the quadrant of a circle of radius a as shown in Fig. Q4a.
b) Two identical rollers, each of weight $Q = 445 \text{ N}$, are supported by an inclined plane and a vertical wall as shown in Fig.Q4b. Assume smooth surfaces, find the reactions induced at the points of support A, B and C.
5. Two blocks connected by a horizontal link AB as supported on two rough planes as shown in Fig. Q5. The coefficient of friction for block A on the horizontal plane is 0.4. The angle of friction for block B on the inclined plane is 15° . What is the smallest weight W of block A for which equilibrium of the system can exist ?
6. Two beams AB and DE are arranged and supported as shown in Fig. Q6. Find the magnitude of the reaction at E due to the force $P = 890 \text{ N}$ applied at B as shown.

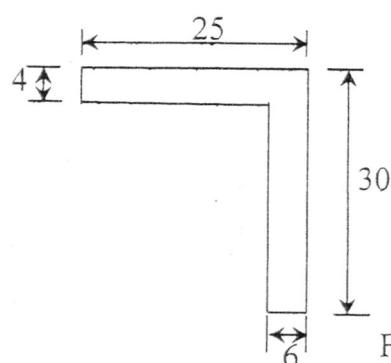


Fig.Q1

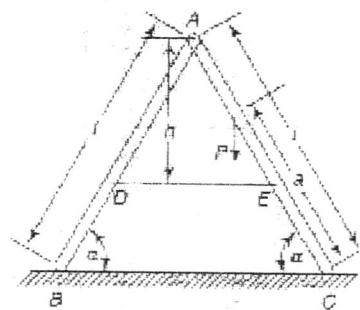


Fig.Q2

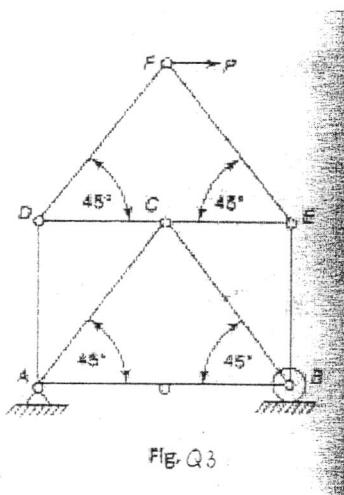


Fig.Q3

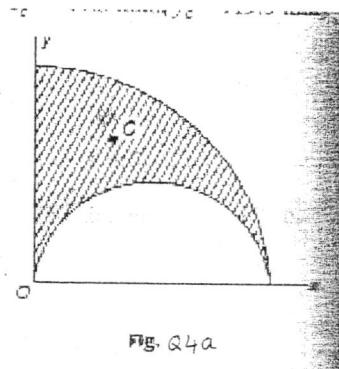


Fig.Q4a

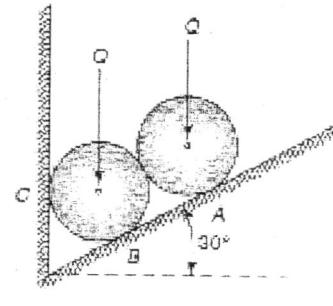


Fig.Q4b

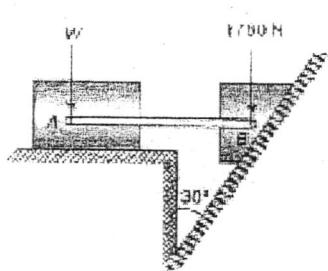


Fig.Q5

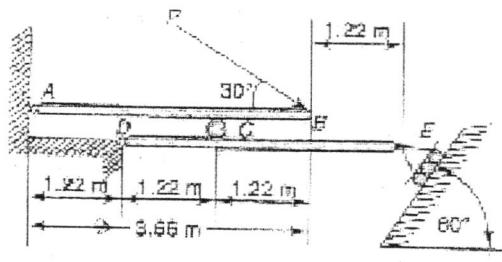


Fig.Q6