

3/12/18

Indian Institute of Engineering Science and Technology, Shibpur
B.Arch. First Semester Final Examination November, 2018
Engineering Mechanics (AM 101A)

Total Marks: 70

Time: 3Hrs

Answer All Questions

1. A beam of length l is supported as shown in Figure 1 and subjected to equal but opposite horizontal forces P as shown in the figure. Find the support reactions. One end is hinged and the other end is supported by a roller, which is placed on an inclined plane. Normal to this plane makes an angle α with the vertical axis as shown in the figure. 10

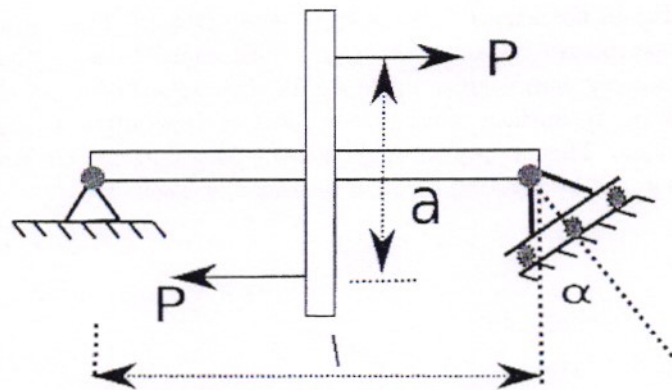


Figure 1.

2. Locate the centroid of the dark area in Figure 2 which is composition of a rectangle, a circular disk and a right angled triangle. All the dimensions (in mm) are provided in Figure 2. 10

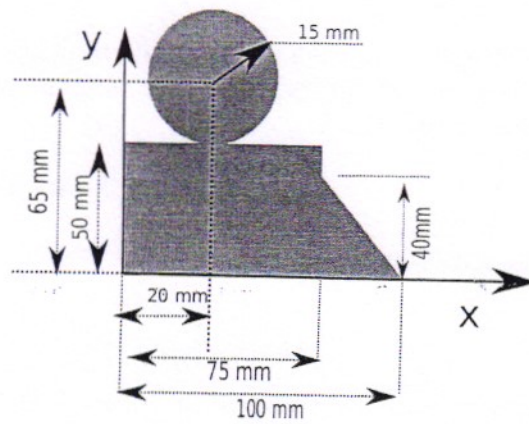


Figure 2.

3. A plane curve in the Figure 3 is made of three different line segments. One line segment passes through the origin. The coordinates of the end points of each line segment is given in the figure. Locate the centroid of this plane curve. Draw the surface generated by rotating (any angle) this plane curve about y axis. This is only a rough sketch. Also find out the area of the surface generated by rotating through an angle 2π about y axis. **15**

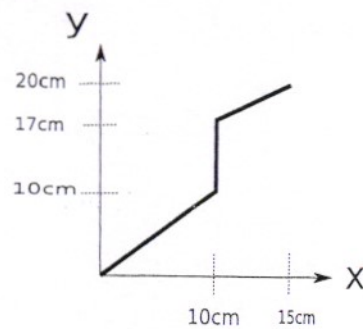


Figure 3.

4. Using method of joints determine the axial force in each bar of the truss given in Figure 4. Now apply method of sections to verify the results for members 1 2 and 3. 15

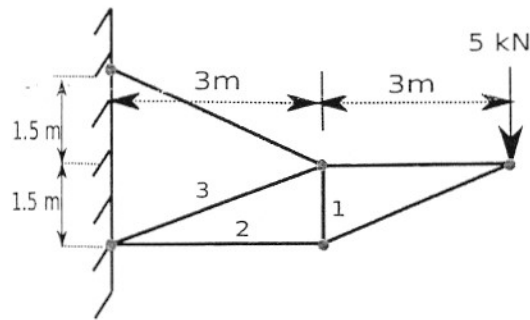


Figure 4.

5. Two balls of weight P and Q are attached by an inextensible string passes over a frictionless pulley as shown in Figure 5. The ball of weight P rests on an inclined plane of angle α and the other ball is hanging vertically as shown in the figure. All the surfaces are smooth. If the system is in equilibrium express the ratio between P and Q in terms of the angle α using the principle of virtual work. With the help of this result prove that the tension is same in the entire string. 10

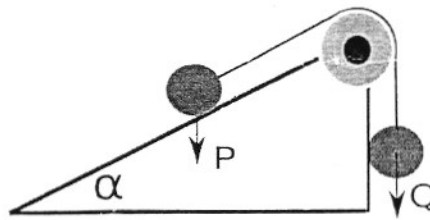


Figure 5.

6. A simply supported prismatic beam is subjected to three equal transverse point forces of magnitude P as shown in Figure 6. Length of the beam is l . Locations of these three forces are mentioned in the figure. Using the principle of virtual work find out the support reactions. Check your result by analysing the system using force balance technique. 10

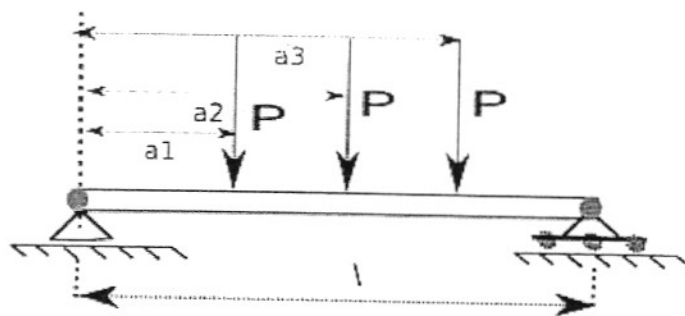


Figure 6.