Code No: 09A1BS05 R09

B. Tech I Year Examinations, May/June -2012
ENGINEERING MECHANICS
(Common to CE, ME, CHEM, MCT, MMT, MEP, AE, AME, MIE, MIM, PTME)
Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
---

1. a) State and prove Varignons theorem.
   b) A roller of radius r = 0.3 m. and weight Q = 2000 N is to be pulled over a curb of height h = 0.15 m. by a horizontal force P applied to the end of a string wound around the circumference of the roller (Ref. Figure 1). Find the magnitude of P required to start the roller over the curb. [5+10]

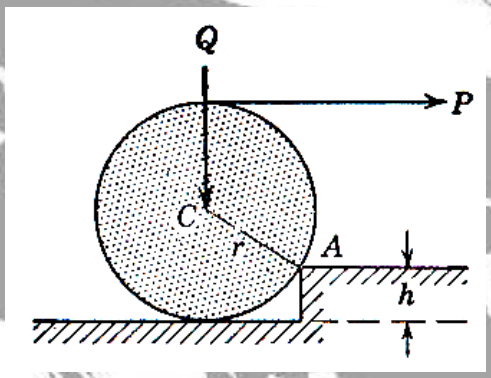

Figure: 1

2. Find the moment of the inertia of the section shown in the figure 2 about horizontal and vertical controidal axes. All dimension in cm R = 8. [15]

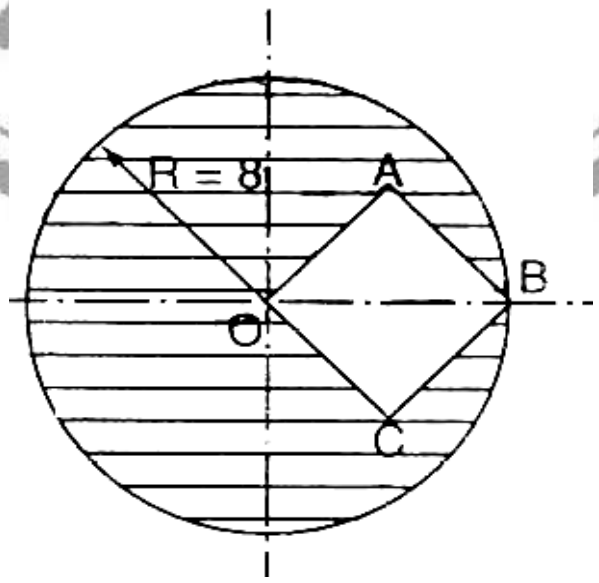

Figure: 2

3. Locate the centroid of the wire bent as shown in figure 3. [15]

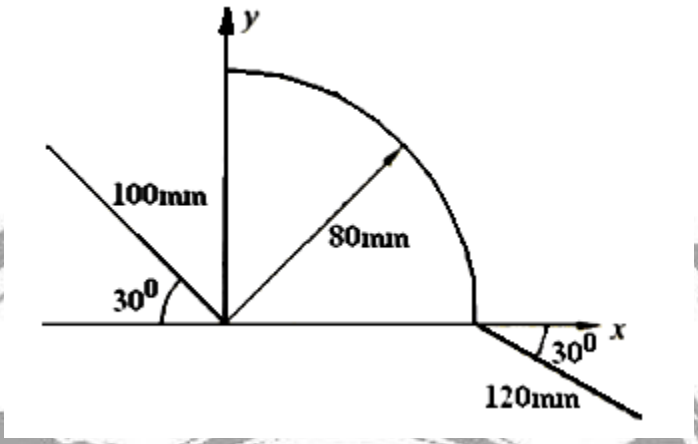

Figure: 3

4. Calculate the magnitude of the clockwise couple M required to turn the 50 kg cylinder in the supporting block shown in figure 4. The coefficient of kinetic friction is 0.30. [15]

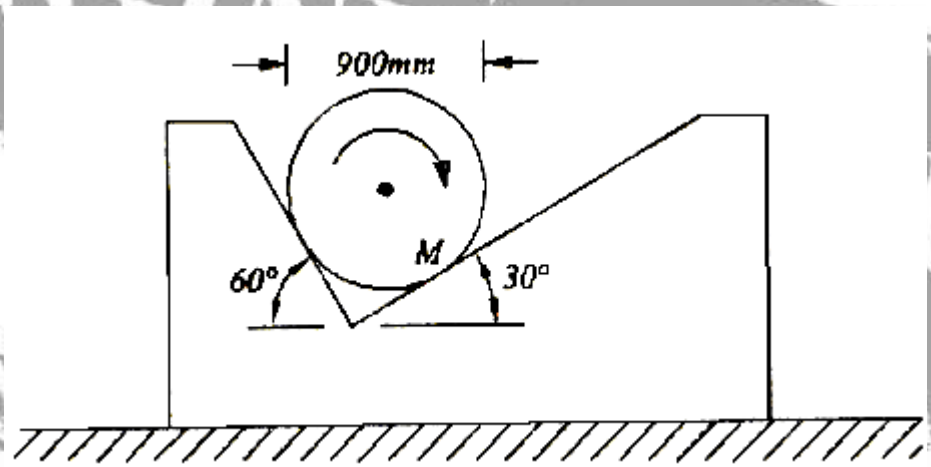

Figure: 4

5. Find the forces in all the members of the truss shown in the figure 5 (All forces are in kN). [15]

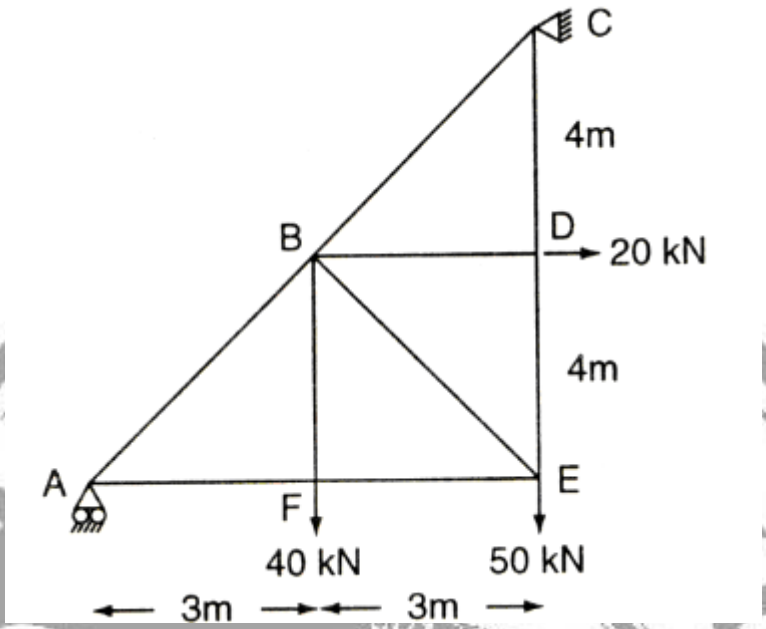

Figure: 5

6. When the angular velocity of a 1.2 m dia pulley is 3 rad/s, the total acceleration of a point on its rim is 9m/s^2. Determine angular acceleration of the pulley at this instance? [15]

7. The step pulley shown in figure 6 starts from rest and accelerates at 2 rad/s^2. What time is required for block A to move 20 m. Find also the velocity of A and B at that time. [15]

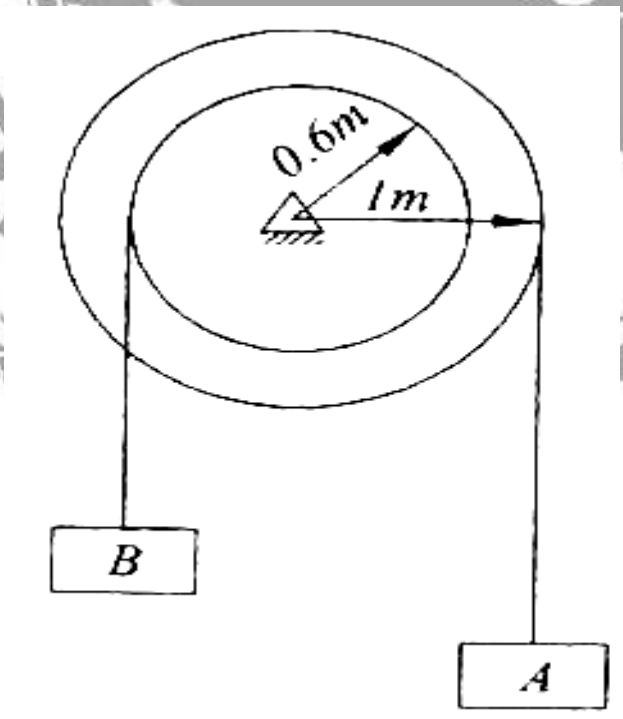

Figure: 6

8. a) Explain the following:
   i) Virtual displacement
   ii) Virtual work
   iii) Ideal system.

   b) Determine the magnitude of the couple M required to maintain the equilibrium of the mechanism, if P=2000N as shown in figure 7. [6+9]

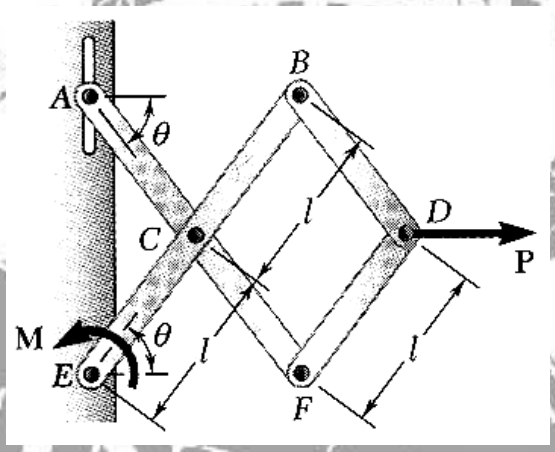

Figure: 7

*****