Code No: 09A1BS05 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, November/December - 2013

ENGINEERING MECHANICS

(Common to CE, ME, CHEM, MCT, MMT, AE, AME, MIE, MIM, PTE, CEE, MSNT, ACE)

Time: 3 hours **Max. Marks: 75**

Answer any five questions

All questions carry equal marks

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1.a) Two smooth spheres *P* and *Q* each of radius 25cms and weighing 1000N, rest in a horizontal channel having vertical walls as shown in figure 1. If the distance between the walls is 90cms, make calculations for the pressure exerted on the wall and floor at points of contact *A*, *B* and *C*.

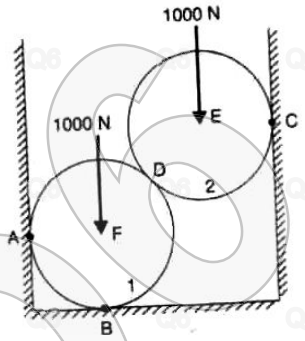

Figure: 1

b) A uniform rod *AB* of length 300mm and weight W rests inside a hemispherical bowl of radius 100mm as shown in figure 2. Neglecting friction, determine the angle θ corresponding to equilibrium. [15]

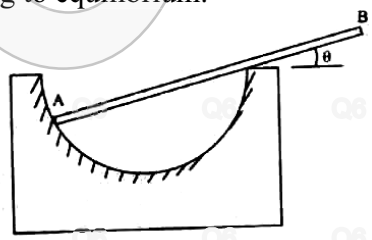

Figure: 2

2. Three similar right circular cylinders *A*, *B* and *C* of weights *W* each are arranged on smooth inclined planes as shown in figure 3. Determine the minimum value of θ that will prevent the arrangement from collapsing. [15]

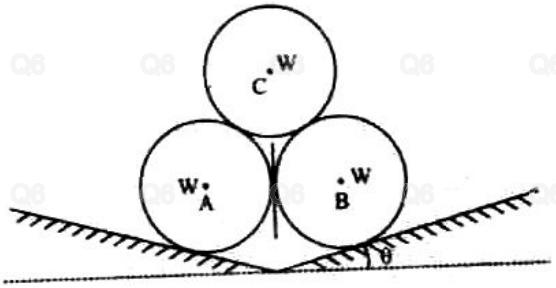

Figure: 3

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3. Determine the co-ordinates of center of gravity of the area OAB as shown in figure 4, if the curve *OB* represents the equation of a parabola, given by $y=kx^2$. [15]

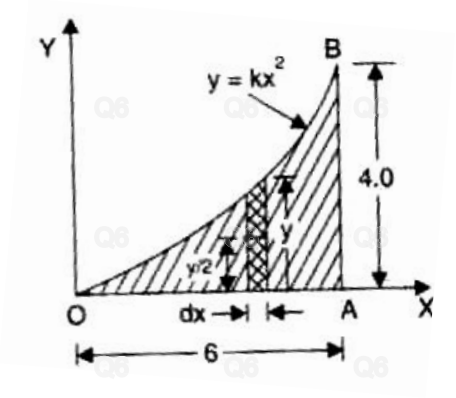

Figure: 4

4.a) Define and explain product of inertia.

b) Determine the mass moment of inertia of a regular solid cone of base diameter *D* and height *H* with a mass density of ρ about a diametral axis on the base. [15]

5. Find out the forces in all the members of the truss using method of joints as shown in figure 5. [15]

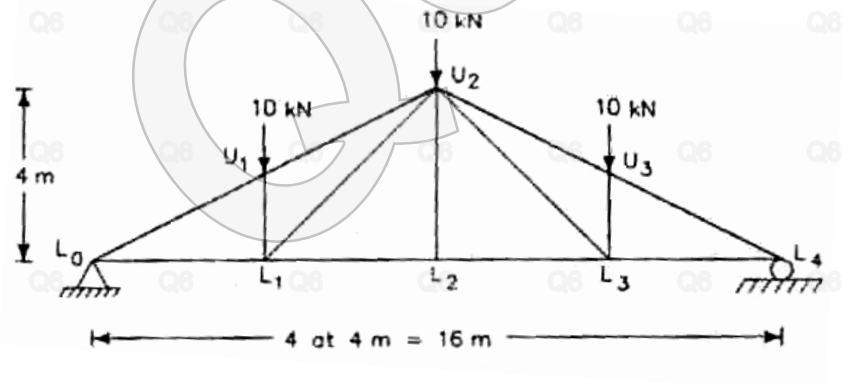

Figure: 5

6. Three marks *A*, *B* and *C* at a distance of 100m each are made along a straight road. A car starting from rest and with uniform acceleration passes the mark *A* and takes 10seconds to reach *B* and further 8seconds to reach the mark *C*. Calculate:
   a) The magnitude of the acceleration of the car
   b) The velocity of the car at *A*
   c) The velocity of car at *B* and
   d) The distance of the mark *A* from the starting point. [15]

7. A car of weight 9810N accelerates from rest to a speed of 45km/hr in a distance of 50m against a resistance of 100N. Find the average driving force acting on the car. Using the average force, find the greatest power developed by the engine.[15]

8. A beam *ABCDE*, 10m long, is hinged at *A* and freely supported at *B* and *D*. AB=2m; *BD*=6m; the overhang *DE*=2m. There is a hinge at *C*, midway between *B* and *D*. The loading consists of a point-load of 15kN at the free end *E*, 20kN at the middle of *BC* and 40kN at the middle of *CD*. Evaluate the reactions at the supports. [15]

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