Bachelor of Mechanical Engineering 1st year 1st semester supplementary examination, 2017

Jadavpur University

Subject : Engineering Mechanics I

Full Marks : 100 **Time: 3 hrs**

Answer any five questions

1 (a) Refer to fig A and find the moment of the force F about point O and OM axis.

(b) Refer to Fig B and replace the system of forces and moments with an equivalent force-moment system to be applied at O. Check whether they can form a wrench. 10+10

2 (a) Refer to Fig C and find out the support reactions at A and B.

(b) Refer to Fig D and find out the magnitude and nature of the forces in each member. 10+10

3 (a) Refer to Fig E and find out the minimum value of the force that can ensure equilibrium. Mass of the rod is 4.5 kg and coefficient of friction for all the surfaces is 0.2.

(b) Refer to Fig F and find out the reaction forces from the walls. 10+10

4 (a) Refer to Fig G and find out the coordinates of the centroid of the shaded area.

(b) Refer to Fig H and find out the Ixx and Iyy of the shaded area. 10+10

5 (a) Deduce the expressions the velocity and acceleration in polar coordinate system for a particle moving along a curved path.

(b) A projectile is fired with a velocity of 300m/s at an angle of 30° with the horizontal in a vertical plane. Find out the tangential and normal acceleration components of the projectile after 10 seconds. Also find out the radius of curvature of the path at that instant. 10+10

6 (a) Refer to Fig I and find out the velocity of the collar when it reaches point B starting from point A. Mass of the collar is 15 kg, F is a constant force of 600N, the rod is smooth, spring constant kis 3N/mm and unstretched length of the spring is 1m.

(b) In a pile driving equipment mass of hammer is 400kg. The hammer H (Fig J) is released from rest and drops from a height of 1.8 m on the pile. If the mass of the pile is 1320 kg and rebound of the hammer is 0.15 m, find out the velocity of the pile just after impact and also percentage loss of kinetic energy of the system. 10+10

7. Write short notes on any four : 4 X 5=20

(a) Two force and three force member

(b) Pappus Guldinus theorems

(c) Free Body Diagram

(d) Basic principle of Screw jack

(e) Parallel axis theorem of moment of inertia.

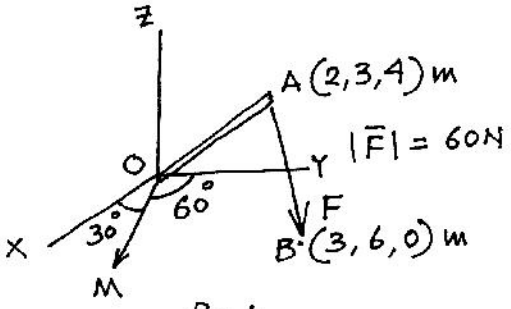


Fig A

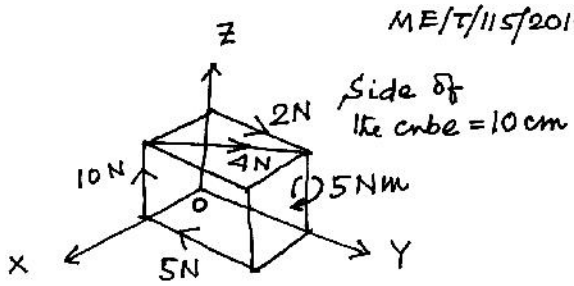
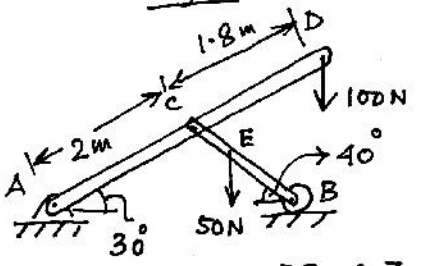


fig B



BE = 0·7m

fig C

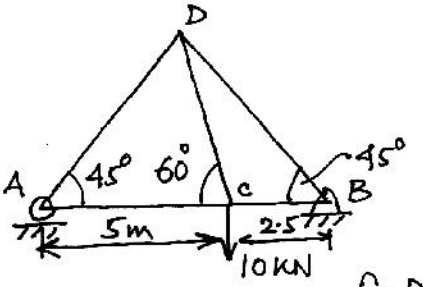


fig D

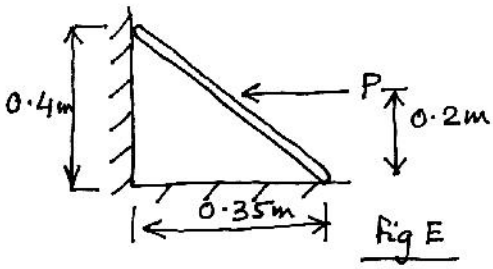


fig E

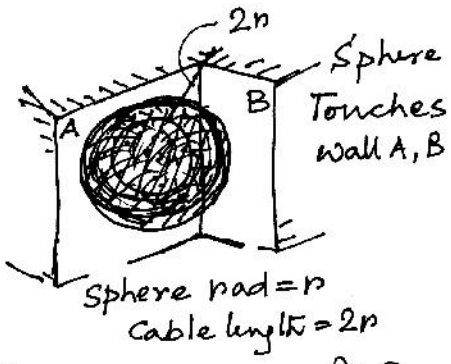


fig F

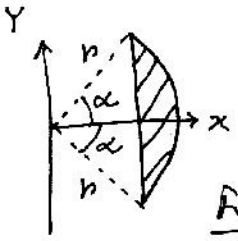


fig G

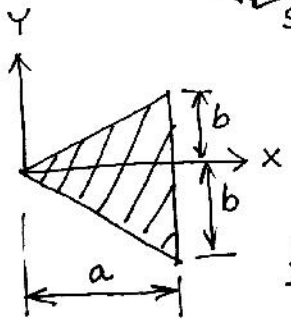


fig H.

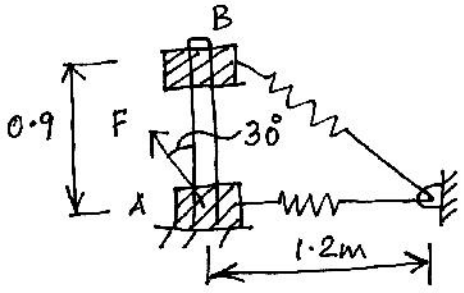


fig I

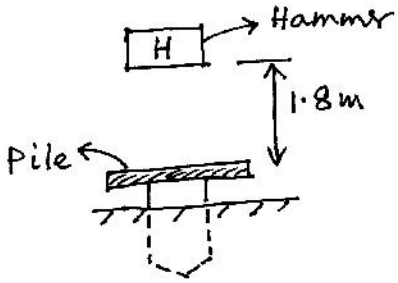


fig J