Code No: R21031 **R10** SET - 1

II B. Tech I Semester Supplementary Examinations, Oct/Nov- 2017
ENGINEERING MECHANICS
(Com to ME, AE, AME, MM)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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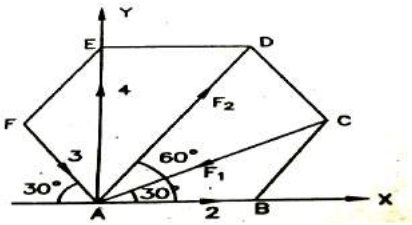
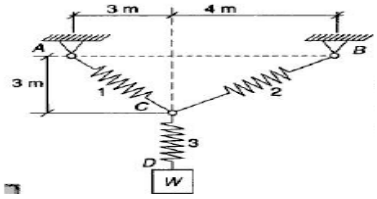
1. a) In a regular hexagon ABCDEF, the forces 2, F_1, F_2, 4 and 3 kN act along AB, CA, AD, AE and FA respectively and the point A is in equilibrium. Determine the values of F_1 and F_2. (9M)



b) Explain the following terms in detail with their applications (6M)
i)Moment ii) Couple

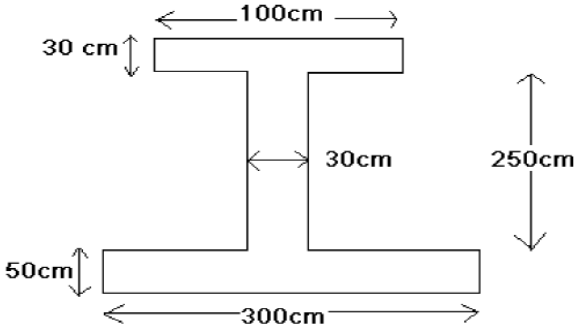
2. a) Determine the stretch in each spring for equilibrium of weight W = 50 N block as shown below. The springs are in equilibrium condition. The stiffness of the springs 1, 2 and 3 are given by 50 N/m, 60 N/m and 70 N/m respectively. (8M)



b) i) What is a free body diagram? Explain. ii) State and prove lami's theorm. (7M)

3. a) Find the Centroid of quadrant of an ellipse, whose equation is $x^2/a^2 + y^2/b^2 = 1$ from basic principles. (10M)
b) Differentiate centroid, centre of gravity and mass centre. (5M)

4. Find the moment of inertia about horizontal centroidal axis and also find the radius of gyration about the same axis for the figure shown below. (15M)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5. a) Using method of sections, determine the axial force in each of the bars 1, 2 and 3 of the tower loaded as shown below. Fig (A) (6M)

b) Determine the forces S1 and S2 induced in the bars AC and BC in Figure shown below, due to the action of the horizontal applied load at C. The bars are hinged together at C and to the foundation at A and B. below. Fig (B) (9M)

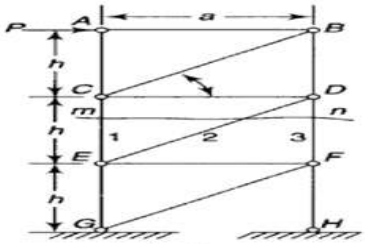


Fig (A)

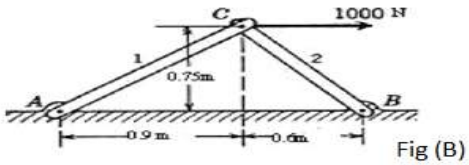
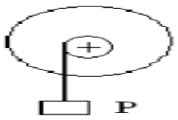


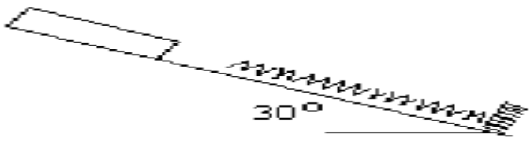
Fig (B)

6. a) A weight 'P' attached to the end of a flexible rope of diameter d=5mm as shown below, is raised vertically by winching the rope on a reel. The reel is turned uniformly at the rate of 2 revolutions per second. Find the tension in the rope. Neglect the inertia of the rope and the lateral motion of the weight 'P'. (8M)



b) A homogeneous sphere of radius of a=100mm and weight W=100N can rotate freely about a diameter. If it starts from rest and gains, with constant angular acceleration, an angular speed n=180rpm, in 12 revolutions, find the acting moment. (7M)

7. a) A block of mass 5Kg resting on a 30^0 inclined plane is released. The block after travelling a distance of 0.5m along the inclined plane hits a spring of stiffness 15N/cm. Find the maximum compression of spring. Assume coefficient of friction between the block and the inclined plane is 0.2. (8M)



b) The brakes are applied to a car of mass 100 kg travelling at 80 kmph so as to cause all the wheels to skid. Determine the time required to stop the car on a wet road having coefficient of friction as 0.1. (7M)

8. A 108 N block is held on a 40^0 incline by a bar attached to a 150 N block on a horizontal plane Figure as shown below. The bar which is fastened by smooth pins at each end is inclined 20^0 to the horizontal. The co-efficient of friction between each block and its plane is 0.325. For what horizontal force P applied to 150 N block will motion to the right be impending? (15M)