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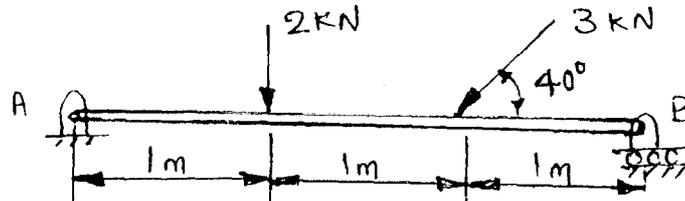
***B.Tech. Degree I & II Semester Supplementary Examination in
Marine Engineering May 2015***

MRE 105 ENGINEERING MECHANICS

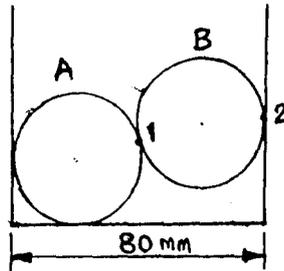
Time: 3 Hours

Maximum Marks: 100

- I. (a) A beam is loaded and supported as shown in figure. Determine the support reactions. (6)

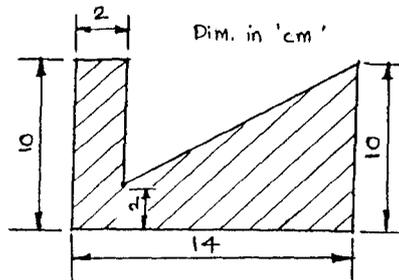


- (b) Two spheres, A of 150 N and B of 250 N, are placed in a channel as shown. The diameter of both spheres are 50 mm. Determine the reaction at contact points 1 and 2. (10)



OR

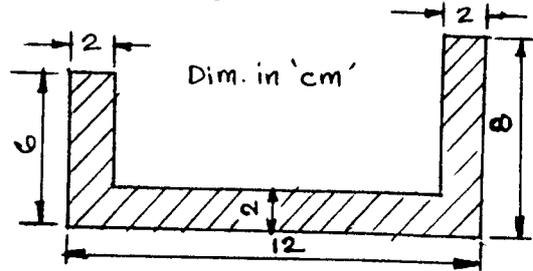
- II. (a) A force of 250 N pulls a body of weight 500 N up an inclined plane, the force being applied parallel to the plane. If the inclination of the plane to the horizontal is 18° , find the coefficient of friction. (8)
- (b) In a collar thrust bearing, the external and internal radii are 25 cm and 15 cm respectively. The total axial load is 50 kN and shaft is rotating at 140 r.p.m. If the coefficient of friction is 0.06, find the power lost in friction assuming uniform pressure. (8)
- III. (a) Derive the expression for moment of inertia of a rectangular section with respect to its centroidal x-axis. (5)
- (b) Locate the centroid of the shaded area. (12)



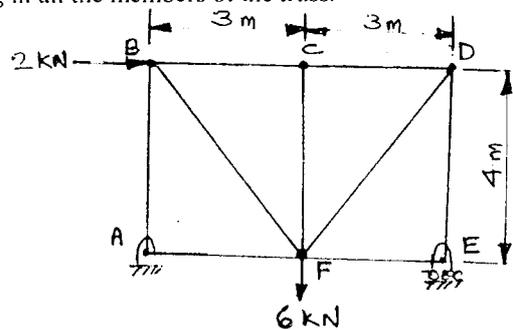
OR

(P.T.O.)

- IV. Find out the moment of inertia of the given area about centroidal x-axis and y-axis. (17)

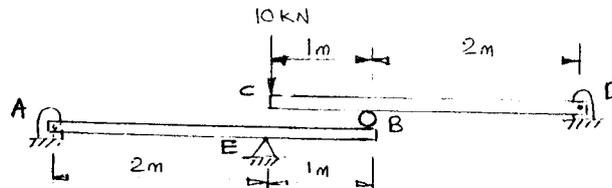


- V. A truss is loaded and supported as shown. Determine the magnitude and nature of axial forces acting in all the members of the truss. (17)



OR

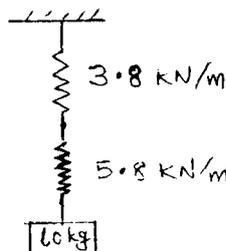
- VI. (a) Explain stable and unstable equilibrium. (5)
 (b) Using the principle of virtual work, determine the reactions at 'B' and 'E' shown in figure. (12)



- VII. (a) A stone is dropped from a tower of 100 m high. At the same time, another stone is projected upwards from the foot of the tower and meets the first stone at a height of 30 m. Find the velocity with which the second stone is projected upwards. (8)
 (b) A block of weight 200 N is initially at rest on a 45° inclined plane. What distance along the plane will the block slide before its velocity becomes 2 m/s? Assume coefficient of friction between the block and plane = 0.1. (8)

OR

- VIII. (a) A railway wagon of mass 50 tons moving with a velocity of 3.6 km/hr backs into another wagon of mass 30 tons that is at rest on a level railway track. What is the velocity of coupled wagons just after the coupling is made? (4)
 (b) A block of mass 60 kg is supported by two springs as shown. The block is pulled 35 mm down and then released. Find period of vibration, maximum velocity and maximum acceleration of the block. (12)



- IX. (a) A car of mass 950 kg is traveling round a circular track of radius 400 m, at a velocity of 18m/s. Determine the horizontal thrust exerted on the wheels. (5)
- (b) A fireman holding a nozzle at a horizontal distance of 4.8 m from a vertical wall, wishes to send a jet of water through a small window 3.4 m vertically above the nozzle. If the inclination of the nozzle tip with horizontal is 55° , calculate the required velocity of the jet at the nozzle exit. (12)

OR

- X. (a) A motor cyclist riding at 20 km/hr has to turn a corner. Find the least radius of the curve he should follow for safe riding, if the coefficient of friction between the tyres and the road is 0.18. (5)
- (b) An air-craft moving horizontally at a speed of 800km/hr at a height of 1200 m releases a bomb that hits the target on the ground. Find (i) time taken by the bomb to hit the target and (ii) the horizontal distance of the air-craft from the target when it released the bomb. (12)
- XI. (a) The armature of an electric motor has an angular speed of 1200 r.p.m. at the instant when power is cut off. If it comes to rest in 5 sec, calculate (i) the angular retardation and (ii) number of revolutions the armature make during this period. (9)
- (b) A disc which weighs 120 kg and 70 cm in diameter is free to rotate about its geometric axis and is constantly accelerated from rest to 300 r.p.m. in 20 sec. Determine the constant torque required to produce this acceleration. (8)

OR

- XII. A solid drum of radius 30 cm and mass 12 kg is free to rotate about its geometric axis as shown in figure. Wound around the circumference of the drum is a flexible cord carrying at its free end a weight $Q = 4$ kg. If the weight Q is released from rest, find (i) the time required for it to fall through a height of 3.5 m (ii) the velocity with which it will strike the floor. (17)

