

B. Tech Degree I & II Semester Examination in Marine Engineering June 2011

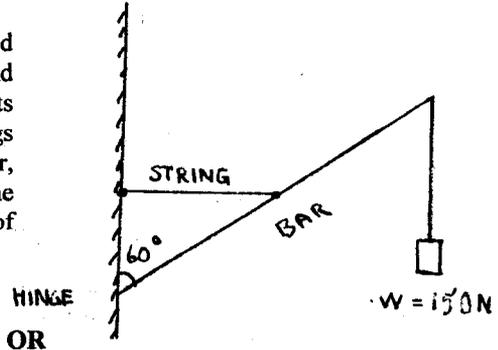
MRE 105 ENGINEERING MECHANICS

Time : 3 Hours

Maximum Marks : 100

- I. a) Two locomotives on opposite banks of a canal pull a vessel moving parallel to the banks by means of two horizontal Ropes. The tension in the ropes have been measured to be 20 kN and 24 kN, while the angle between them is 60° find the resultant pull on the vessel and the angle between each of the ropes and the sides of the canal. (7)

- b) A rigid prismatic bar 5m long is supported in a vertical plane by hinge at one end and by a horizontal string attached to it at its mid point. A 150N weight hangs vertically from the free end of the bar, neglecting weight of bar. Determine tension in the string and the direction of the reaction at the hinge. (10)



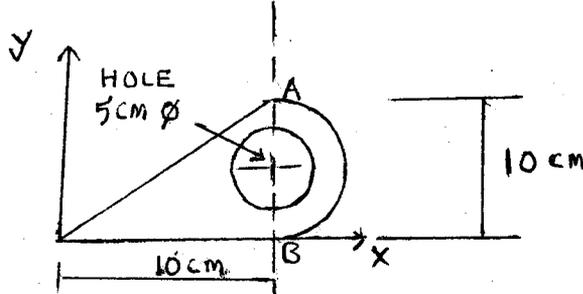
OR

- II. In a thrust bearing, the external and internal diameters of the contacting surfaces are 320mm and 200mm respectively. The total axial load is 80kN and the intensity of pressure is 350kN/m^2 . The shaft rotates at 400 rpm. Taking the co-efficient of friction as 0.06, calculate the power lost in overcoming the friction. Also find the number of collars required for the bearing. (17)

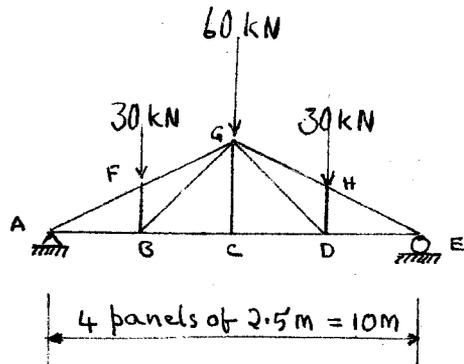
- III. a) Derive equation for moment of inertia of a rectangular section with respect to its centre of gravity. (7)
b) Determine I_{xx} , I_{yy} and polar moment of inertia for an ellipse about its centroid. (10)

OR

- IV. Find the MI of the Area shown about the axis AB (17)



- V. Find the forces in members BG, FG and BC for the truss shown. (17)



OR

- VI. A horizontal beam ABCDE is supported on rollers at B and E and hinged at C. It has also an internal hinge at D. (17)
 AB= 1M, BC = 3M, CD= 2M and DE = 4M. A vertical load of 200kN acts at A and another of 500kN acts at 2M from E. using the method of virtual work, determine the support reactions at B, C and E.

- VII. A motorcycle of mass 120kg. is traveling on a horizontal road at 54 km/hr. Find the time required to stop the motor cycle if the co-efficient of friction between the tyres and the road is 0.4 solve the problem using (i) Impulse – momentum method (17)
 (ii) Conservation of energy method
 (iii) Force method

OR

- VIII. A vertically mounted spring is found to deflect by 15mm when a body of 30N weight is suspended from it. How many oscillation are made by the body? Subsequently the body is displaced through a distance of 30mm from the mean position and then released. Calculate the maximum force to which the spring would be subjected? (17)

- IX. Two balls are projected from the same point in directions inclined at 60° and 30° with the horizontal. Calculate the ratio of their velocities of projection if (i) The balls attain the same maximum height (ii) the ranges are equal for the balls. (16)

OR

- X. The motion of a gear is defined by the relation $\theta = 2t^3 - 5t^2 + 8t + 20$ when θ is in radius and t is in seconds. Determine the angular displacement, angular velocity and the angular acceleration at time t = 3 seconds. (16)

- XI. A fly wheel of mass 4000kg. and radius of gyration 0.8m loses its speed from 360rpm to 250rpm in 2 minutes. Make calculations for (i) The torque acting on the wheel. (16)
 (ii) Change in kinetic energy and angular momentum of the wheel during the given period.

OR

- XII. Find the period of small oscillation of the compound pendulum shown which consist of (16)
 a disc of weight 'W' and radius 'r' suspended by a slender rod of weight $\frac{W}{6}$ and length 2.4r.

