Code.No: R09A1BS05 | R09 | SET-3

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
I B.TECH – REGULAR EXAMINATIONS, JUNE - 2010
ENGINEERING MECHANICS
(COMMON TO CE, ME, CHEM, MECT, MMT, MEP, AE, AME)

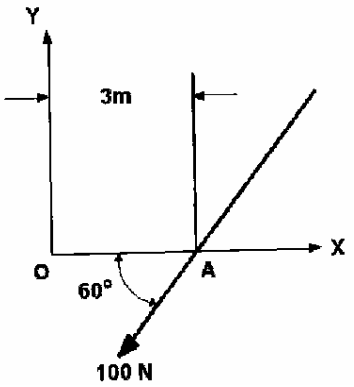
Time: 3hours **Max.Marks:80**

Answer any FIVE questions
All questions carry equal marks

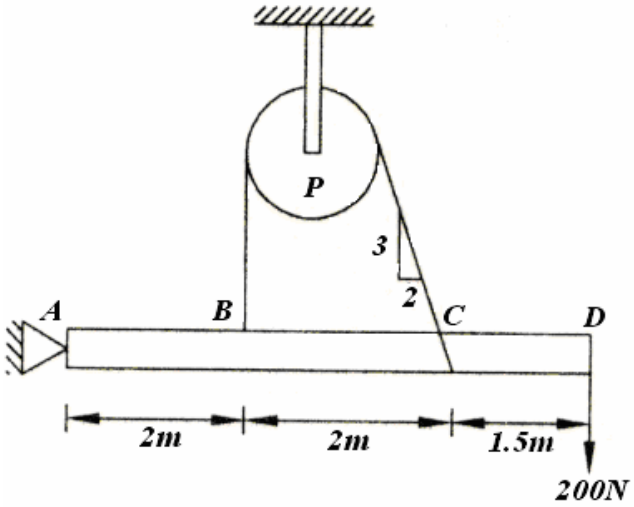
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1.a) A Horizontal line PQRS is 12 m long, where PQ = QR = RS = 4m. Forces of 1000, 1500, 1000 and 500N act at P, Q, R and S respectively and line of action of these forces make angles of 90^0, 60^0, 45^0 and 30^0 respectively with PS. Find the magnitude, direction and position of the resultant force.

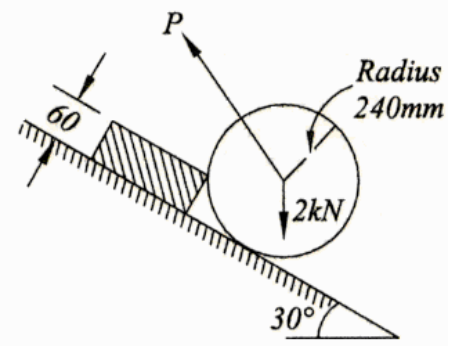
b) A force of 100 N is acting at a point A as shown in figure. Determine the moments of this force about 0. [8+7]



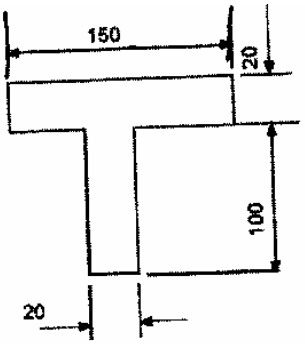
2.a) Determine tension in cable and horizontal and vertical component of reactions at pin A. The pulley P is frictionless as shown in figure.



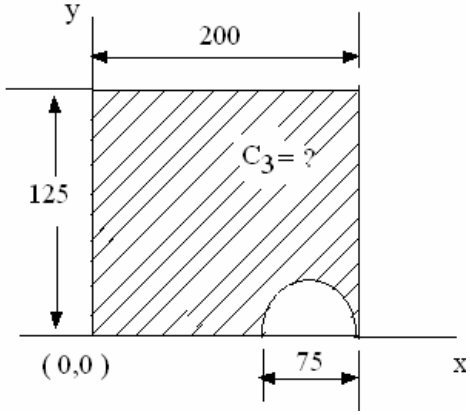
b) Determine the amount and direction of smallest force P required to start the wheel over the block. What is the reaction of the block as shown in figure? [8+7]



3.a) Find the centre of gravity of the lamina as shown in figure. All dimensions are in mm.



b) Determine the coordinates of centroid of the shaded area as shown in figure, if the area removed is semicircular. All dimensions are in mm. [7+8]

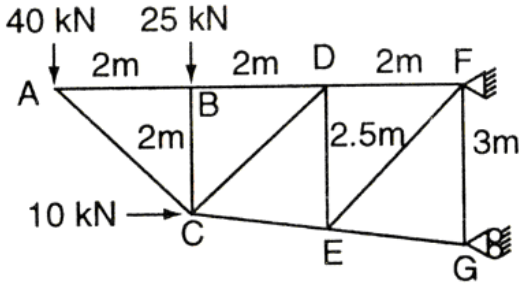


4.a) Determine the moment of Inertia of a triangle with respect to its centroidal x axis parallel to the base.

b) Determine the mass moment of inertia of a slender rod of length L and a mass 'm' with respect to an axis perpendicular to the rod and passing through one end of the rod. [7+8]

5.a) What are different types of frames? Explain with neat diagrams.

b) Find the forces in all the members of the truss shown in the figure (All forces are in kN) using method of joints. [7+8]



6.a) A ball is projected with an initial velocity of 10 m/s at an angle of 45^o with the horizontal. Find the time of flight, maximum height attained and the horizontal range.

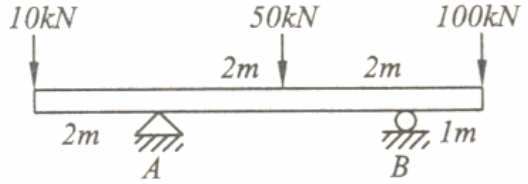
b) A projectile is fired from the edge of a 90 m high at an angle of 30^0 with the horizontal. If the velocity of projection is 120 m/s determine.

i) The horizontal distance from the point of projection to the point where it strikes the ground.

ii) The maximum height reached by the projectile above the ground. [7+8]

7. A spring is used to stop a 100 kg package which is moving down on an inclined plane and makes an angle of 25^0 with horizontal. The spring constant is k = 30 kN/m and is held by cables so that it is initially compressed by 80 mm. If the velocity of the package is 8 m/s when it is at 12.5m from the spring, determine the maximum additional deformation of the spring in bringing the package to the rest position. Assume μ = 0.30. [15]

8.a) Determine reaction at supports using the principle of virtual work.



b) Two beams AC and CD of length 9m and 10 m respectively are hinged at C. These are supported on rollers at the left and right ends (A and D). A hinged support is provided at B, 6m from A. Using the principle of virtual work, determine the reactions at the hinge C and at support B when a load of 600 N acts at a point 5 m from D. [7+8]

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