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312303

December, 2019

B.Tech. (Civil) - III SEMESTER

ENGINEERING MECHANICS (ESC-202)

Time : 3 Hours] [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART - A

1. (a) Define the terms: (i) Friction; (ii) Coefficient of friction. (1.5)

(b) State the principle of impulse and momentum for a rigid body. (1.5)

(c) Define the term Moment of inertia. (1.5)

(d) How the trusses are classified. (1.5)

(e) State the Work - Energy principle. (1.5)

(f) State the D'Alembert's principle. (1.5)

(g) Differentiate between angular and linear impulse. (1.5)

(h) Define Instantaneous centre of rotation in plane motion. (1.5)

(i) State the principle of virtual work. (1.5)

(j) When does a given system of parallel forces can be reduced to couple? Discuss. (1.5)

PART - B

2. A prismatic bar AB of length 5m and of negligible weight is hinged at A and supported at B by the string passes over a pulley C. A vertical load of 60 KN is applied at end B of the bar is supported by a force P applied to the string. Find the axial force in the bar shown in figure 1 and the limiting value of tension T when the bar approaches vertical position. Distance between hinge and pulley is 6m. (15)

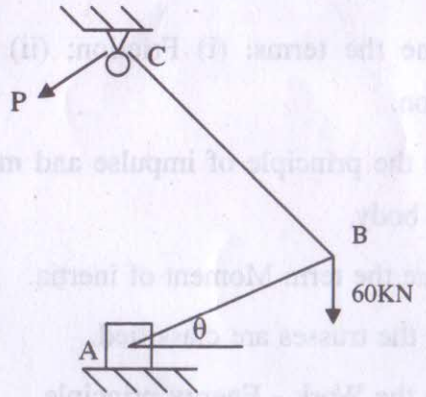

Figure 1

3. (a) Find out forces in all members of truss shown in figure 2. Length of all members is 5 m. (10)

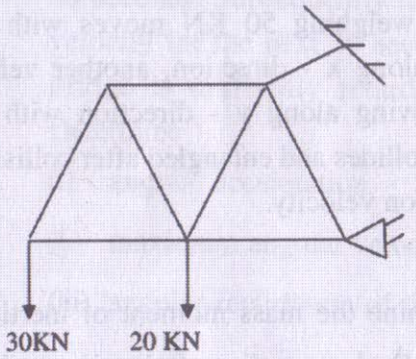

Figure 2

(b) Derive an expression for mass moment of inertia of solid cylinder about transverse axis. (5)

4. (a) Find out centroid of given section shown in figure 3. Take X = 40 (10)

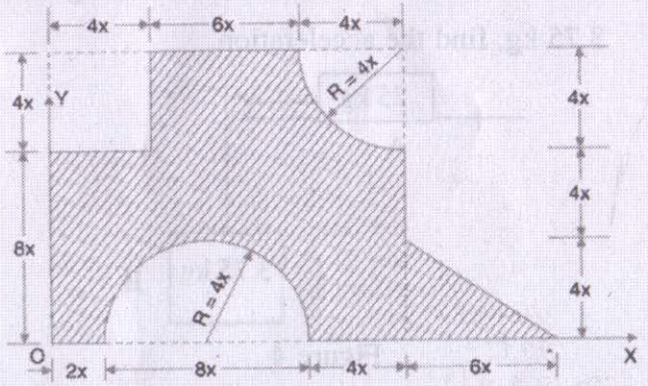

Figure 3

(b) Explain stability of equilibrium. (5)

5. A vehicle weighing 50 KN moves with a velocity of 60 km/hr along x - direction, another vehicle weighing 25 KN moving along y - direction with a velocity of 90 km/hr, collides and entangled after collision. Determine their common velocity. 15)

6. (a) Determine the mass moment of inertia of sphere of radius R about a diametral axis passing through its Centre or Centre of gravity. (7)

(b) A body of mass 25 kg resting on horizontal table is connected by a string passing over a pulley at the edge of table to another body of 3.75 kg and hanging vertically. Friction for table is just sufficient to prevent the motion. If an additional load 1.25 kg is added to 3.75 kg, find the acceleration. (8)

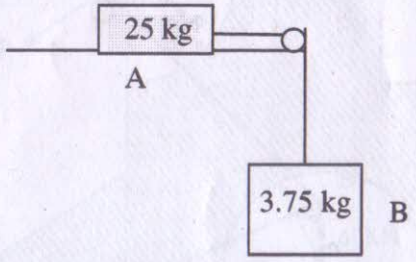

Figure 4

7. A swing bridge turns through 900 in 100 seconds, the bridge is uniformly accelerated from the rest for the first 30 seconds. Subsequently it turns with a uniform angular velocity for the next 50 seconds. Then the motion of the bridge is uniformly retarded for the last 20 seconds. Determine

(i) angular acceleration.

(ii) maximum angular velocity.

(iii) angular retardation of the bridge swing. (15)