Code No: 153AW

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, August/September - 2022
ENGINEERING MECHANICS
(Electrical and Electronics Engineering)

Time: 3 Hours **Max.Marks:75**

Answer any five questions
All questions carry equal marks
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1.a) Explain various types of coplanar and non-coplanar system of forces with neat sketches.

b) Determine the magnitude and direction for the system of coplanar non-concurrent forces acting on a beam as shown in the figure1. [7+8]

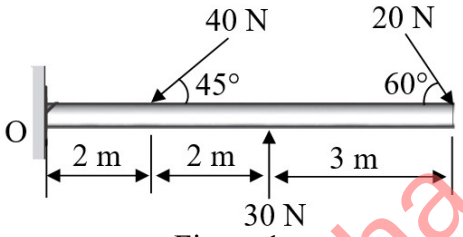

Figure 1

2. A 250 kN cylinder is supported by a frame ABC which is hinged to the wall at A as shown in the figure 2. Determine the reactions at the points A, B, C and D. Neglect the weight of the frame. [15]

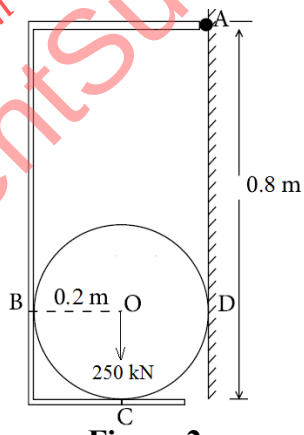

Figure 2

3. Find the centroid of the Z-section shown in figure 3. The thickness at all sections is 20 mm. [15]

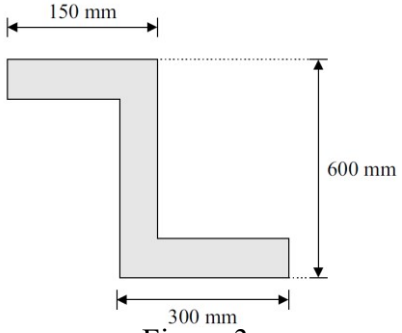

Figure 3

4. The three blocks with weights as shown in figure 4 are placed on a 20 ^{0} inclined plane so that they are in contact with each other and at rest. Determine which, if any, of the blocks will move and the friction force acting under each. Assume that under blocks 'A' and 'C', the coefficients of friction are μ_s=0.50 and μ_k=0.40 while under B they are μ_s=0.30 and μ_k=0.20. [15]

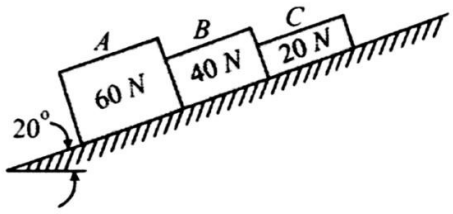

Figure 4

5.a) State and prove the perpendicular axis theorem for area moment of inertia.
b) Explain why moment of inertia is always positive while product of inertia can be positive or negative. [7+8]

6. A homogeneous block with a mass density of 7850 kg/m^3 with the dimensions as shown in figure 5 has a hole of 30 mm diameter drilled at its centre. Determine its mass moment of inertia about the vertical axis. [15]

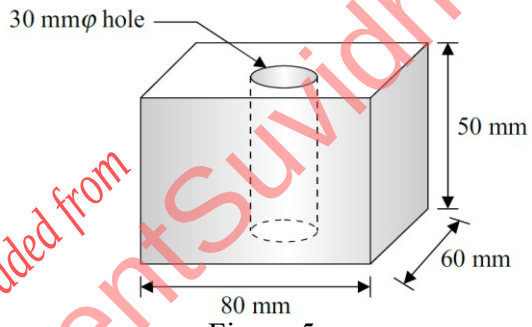

Figure 5

7.a) A car covers 100 m in 10 seconds, while accelerating uniformly at a rate of 1 ^{2}m/s Determine(i) initial and final velocities of the car, (ii) distance travelled before coming to this point assuming it started from rest, and (iii) its velocity after the next 10 seconds.
b) A balloon is ascending from the ground at a constant acceleration of 0.5 m/s ^{2}. After 30 seconds from the start, a ball is released from the balloon. Determine the velocity with which it will strike the ground and the time taken to reach the ground. [8+7]

8.a) State the work-energy principle.
b) In figure 6, a force of 30 N is applied on the lower block of 5 kg mass, over which another block of 3 kg mass rests. Determine the acceleration of the blocks and the tension in the string assuming it to be inextensible. The coefficient of kinetic friction for all contact surfaces is 0.15. [6+9]

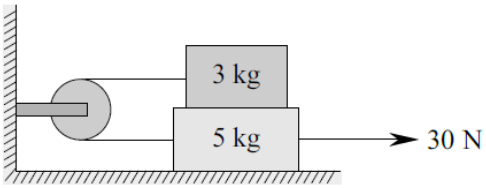

Figure 6

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