Code No: 153AW

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, September - 2021
ENGINEERING MECHANICS
(Electrical and Electronics Engineering)

Time: 2 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) A right circular roller of weight 650 N rests on a smooth horizontal floor and is kept in position with a string. Determine the tension in the string and floor reaction if there is a pull of 213 N as shown in figure 1.

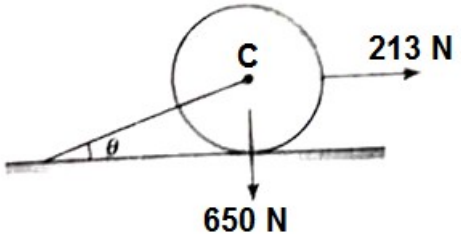

Figure 1

b) A 2 m × 4 m plate is subjected to a system of two coplanar forces as shown in figure 2. Determine the equivalent action at centroid of the plate that may replace the force system. [7+8]

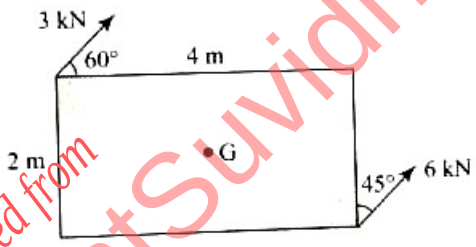

Figure 2

2.a) Concurrent forces 3P, 7P and 5P act respectively along three directions, which are parallel to the side of an equilateral triangle taken in order. Determine the magnitude and direction of the resultant.

b) Four forces having magnitudes of 20N, 40N, 60N and 80N respectively, are acting along the four sides (1m each), of a square ABCD taken in order, as shown in figure 3. Determine the magnitude and direction of the resultant force. [7+8]

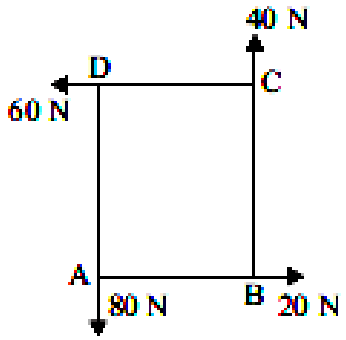

Figure 3

3. A block overlaying at 10^0 wedge on a horizontal floor, leaning against a vertical wall and weighing 2000 N is to be raised by applying a horizontal force to the wedge, Assuming coefficient of friction for all contact surface as 0.25, determine the minimum horizontal force to be applied to raise the block shown in figure 4. [15]

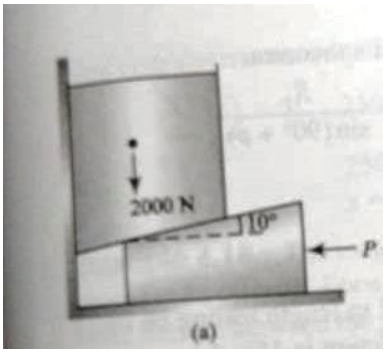

Figure: 4

4. A Screw jack has square threads of mean diameter 6cm of helix angle of 10^0 and coefficient of friction 0.25. Determine the force that must be applied to the end of 50 cm lever to a) rise b) lower a weight of 2500 N. [15]

5. Determine the moment of inertia an area of a triangle with a rectangular cut as shown in Figure 5 about the base *A-B* and the centroidal axis parallel to *AB*. (All dimensions are in Centimetres). [15]

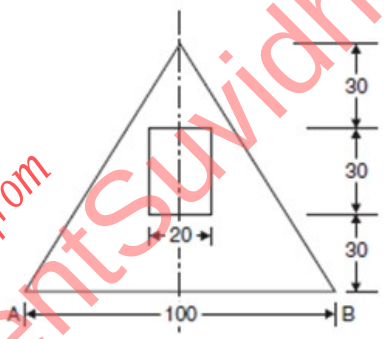

Figure 5

6. Derive the expression for mass moment of inertia of prism along three axes. [15]

7. The 3000 N block starting from rest as shown in the figure 6 slides down a 50^0 inclined plane. After moving 2 m it strikes spring whose modulus is 20 N/mm. If the coefficient of friction between the block and inclined plane is 0.2, determine the maximum deformation of the spring and the maximum velocity of the block. [15]

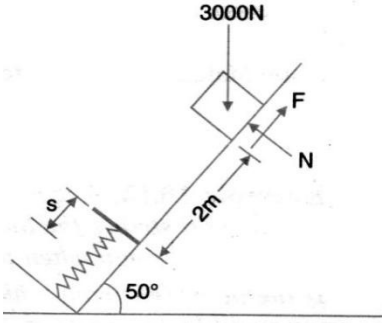

Figure 6

8.a) An elevator gross weight 15 kN is moving in the upward direction, such that the displacement is given by $x = {}^{3}t - 4t^{2} + 6t + 7$ m. Determine the tension in the cable supporting the elevator at t = 2 seconds.

b) A car starts from rest on a curved road of 250 m radius and accelerates at a constant tangential acceleration of 0.6 m/sec^2. Determine the distance and time for which that car travel before the magnitude of total acceleration attained it becomes 0.75 m/sec. [7+8]

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