JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, October/November - 2020
ENGINEERING MECHANICS
(Common to CE, ME, AE, AME, MIE, PTM)

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

Answer any five questions
All questions carry equal marks
- - -

1.   Explain the procedure of finding the resultant of coplanar concurrent force system.
[15]

2.   A vertical mast is guyed by three cables PA, PB and PC tied at a common point P at 12 m above the ground. The base points of the cables are A(5,-1, 0), B(-3, -4, 0) and C(-2,5,0) m. If the tension in the cable PB is 40 kN, calculate the tensions to be provided in PA and PC so that the resultant force exerted on the mast is vertical. Determine the force exerted on the mast.   [15]

3.   State and explain the laws of solid friction.   [15]

4.   Find the length of belt necessary to drive a pulley of 500 mm diameter running parallel at a distance of 12 m from the driving pulley of diameter 1600 m.   [15]

5.a)   Derive an expression to determine the moment of inertia of a semi circle about its diametric base.
  b)   Find the moment of inertia of the shaded area, as shown in figure 1 about its centroidal axes parallel to x axis.   [7+8]

Figure: 1

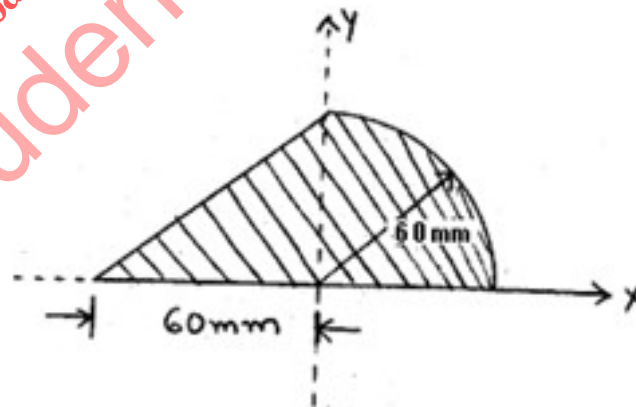6.   Determine the polar moments of inertia of the composite lamina shown in figure 2.
                                                                                            [15]
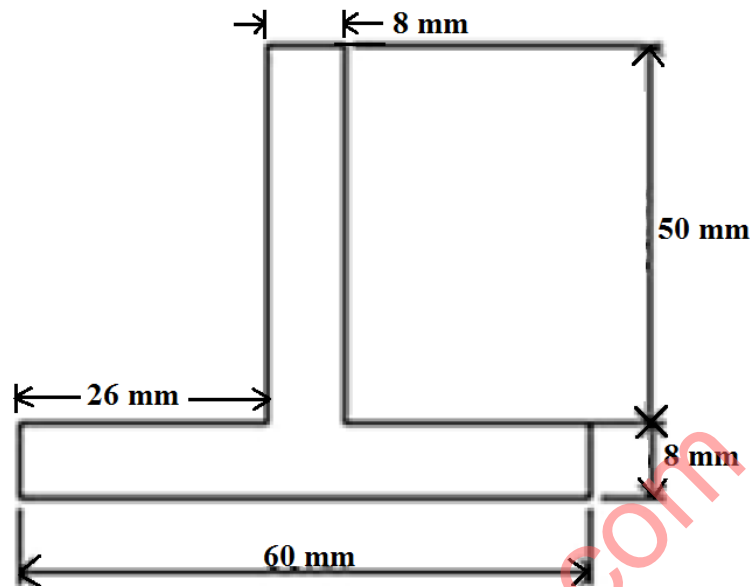

Figure: 2

7.   A sphere of mass m_1 is moving at a speed u_1 in a direction which makes an angle Θ with the x axis. The sphere then collides with a stationary sphere mass m_2 such that at the instant of impact the line joining the centres lies along the x axis. Derive expressions for the velocities of the two spheres after the impact. Assume ideal impact. For the special case when $m_1 = m_2$ show that after impact the two spheres travel along paths which are 90^0 to each other, irrespective of the angle Θ.   [15]

8.   Determine the stiffness in N/cm of a vertical spring to which a weight of 75 N is attached and is set vibrating vertically. The weight makes 3 oscillations per second.   [15]

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