Code No: **R201210** **R20** **SET - 1**

I B. Tech II Semester Supplementary Examinations, January/February - 2023
ENGINEERING MECHANICS
(Common to ME, PE, Agri E, Food E)

Time: 3 hours Max. Marks: 70

Answer any FIVE Questions ONE Question from Each Unit
All Questions Carry Equal Marks

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UNIT - I

1 a) Determine the forces S_1 and S_2 induced in the bars AC and BC in Figure: due to the action of the horizontal applied load at C. The bars are hinged together at C and to the foundation at A and B. [7M]

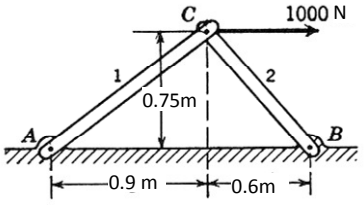


Figure:

b) A roller of radius r = 0.3 m. and weight Q = 2000 N is to be pulled over a curb of height h = 0.15 m. by a horizontal force P applied to the end of a string wound around the circumference of the roller in Figure Find the magnitude of P required to start the roller over the curb. [7M]

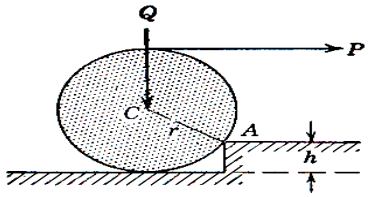


Figure:

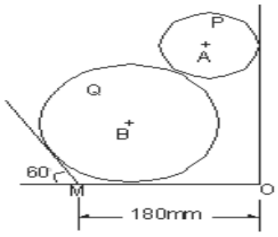
(OR)

2 a) Explain coulomb's laws of dry friction in detail. [5M]

b) Two equal bodies A and B of weight 'W' each are placed on a rough inclined plane. The bodies are connected by a light string. If $\mu_A = 1/2$ and $\mu_B = 1/3$, show that the bodies will be both on the point of motion when the plane is inclined at tan-1 (5/12). [9M]

UNIT - II

3 Two cylinders P and Q rest in a channel as shown in the figure 3. The cylinder P has a diameter of 100 mm and weighs 200 N whereas the cylinder Q has diameter of 180 mm diameter and weighs 500N. If the bottom width of the box is 180 mm, with one side vertical and the other inclined at 60^0, determine the reactions at all the four points of contact. [14M]



Figure
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(OR)

4 Find resultant of given system of forces as shown in Figure. [14M]

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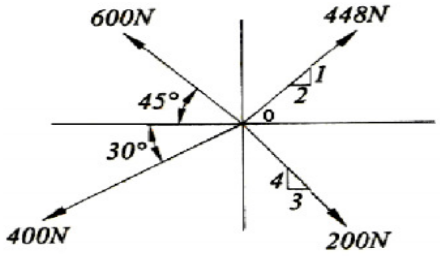

Figure:

UNIT - III

5 a) Find the centroid of the area shown in Figure. All dimensions are in cm. [8M]

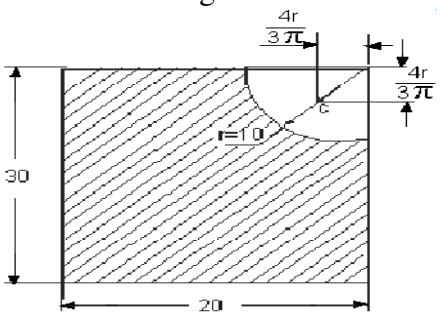

Figure:

b) Explain Pappus theorems in detail. [6M]

(OR)

6 Compute the mass moment of inertia about the x – axis of the steel link shown in figure. [14M]

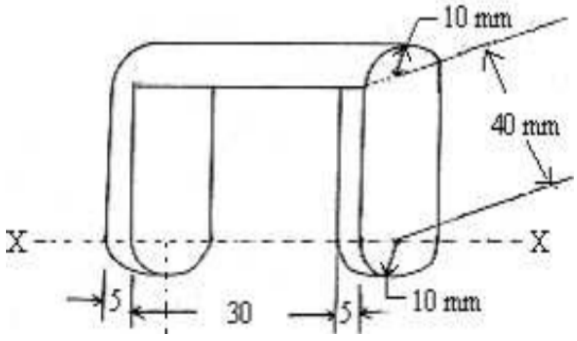

Figure:

UNIT - IV

7 a) Find the power required to pull a train up an incline of 1 in 200 at a speed of 36kmph, if the weight of the train is 3000 kN and the track resistance is 5 N/kN. Also determine the maximum speed with which the train moves up on incline of 1 in 100 with the same power. [8M]

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. [6M]
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.

(OR)

8 a) A balloon is rising with a constant velocity of 5 m/s. A stone is released from within it with an upward velocity of 10 m/s relative to that of the balloon. Determine: i) When the stone will return to the balloon ii) The velocity of the stone when it returns to the balloon and iii) The distance moved by the balloon during this time. [8M]

b) The motion of a particle is defined by the relation $x = t^3 - 12t^2 + 36t + 30$ where x is expressed in meters and t is in sec. Determine the time, position, and acceleration; when v = 0. [6M]

UNIT - V

9 a) Two rigid bodies of weights W_1 and W_2 are connected by an inextensible string and pulled by a force P. The paths of motion of the bodies are at an angle θ to each other. Derive the work energy equation for the system. [8M]

b) Explain impulse momentum method. [6M]

(OR)

10 10. Two blocks are joined by an inextensible cable as shown in figure 7. If the system is released from rest, determine the velocity of block A after it has moved 2 m. Assume that μ equals to 0.25 between block A and the plane and that the pulley is weightless and frictionless. [14M]

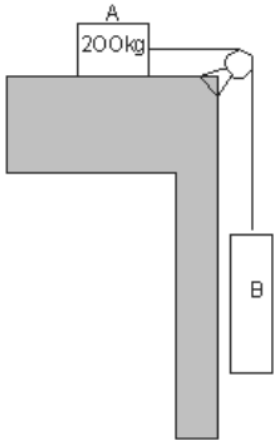

Figure 7

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