Code No: R201124 **R20** SET - 1

I B. Tech I Semester Regular Examinations, July/August- 2021

ENGINEERING MECHANICS

(Com. to Auto E, Min 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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1 a) An object of weight 100 N is kept in position on a plane inclined 30° to the Horizontal by a horizontally applied force (F). If the coefficient of friction of the surface of the inclined plane is 0.25,determine the minimum magnitude of the Force (F). (7M)

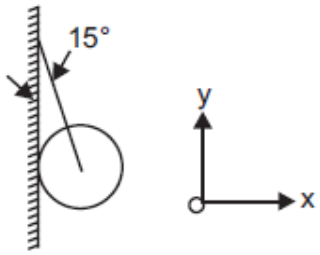
b) Two forces of 80N and 70N act simultaneously at a point. Find the resultant force, if the angle between them is 150^0. (7M)

Or

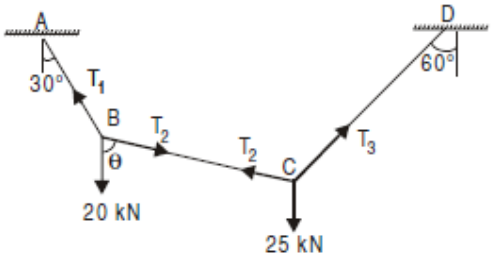
2 a) Define and Prove Moment of force & mention it's Applications. (7M)

b) A force of 250 N pulls a body of weight 500 N up an inclined plane, the force being applied parallel to the plane. If the inclination of the plane to the horizontal is 15°, find the coefficient of friction. (7M)

3 a) A sphere of weight 100 N is tied to a smooth wall by a string as shown in Figure. Find the tension T in the string and reaction R of the wall. (7M)



b) A wire is fixed at two points A and D as shown in Figure has Two weights 20 kN and 25 kN are supported at B and C, respectively. When equilibrium is reached it is found that inclination of AB is 30° and that of CD is 60° to the vertical. Determine the tension in the segments AB, BC and CD of the rope and also the inclination of BC to the vertical. (7M)



Or

4 a) State and explain the law of polygon of forces. (6M)

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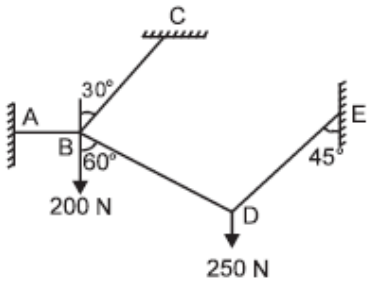
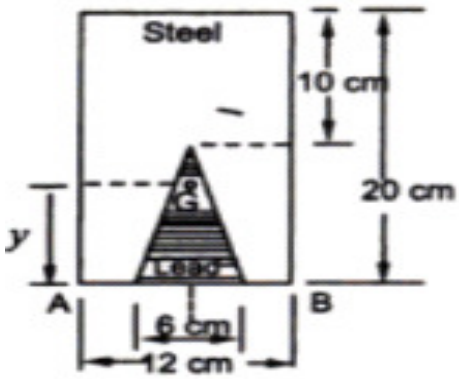
b) A system of connected flexible cables shown in Figure is supporting two vertical forces 200 N and 250 N at points B and D. Determine the forces in various segments of the cable. (8M)



5 a) Derive the centriod of semi circle. (7M)

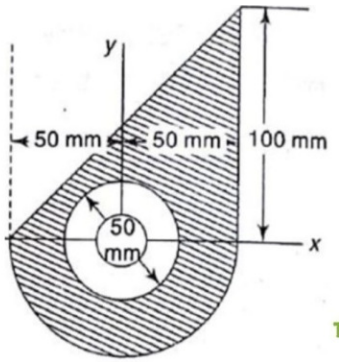
b) A steel cylinder has a base diameter of 120 mm and height of 200mm. A hole in the shape of a right circular cone of base diameter 60 mm and height 100 mm is made in the cylinder. The base of the cone coincides with the base of the cylinder and the two axes also coincide with each other. The cone filled with lead of specific gravity 11.37. The specific gravity of steel is 7.83. Locate the center of gravity of the composite body in Figure with respect to the base. (7M)



Or

6 a) Find the mass moment of inertia of a solid cylinder of radius r and mass m about any axis. (7M)

b) Calculate moment of inetia of shaded portion about X - axis of following Figure. (7M)



7 The position of a particle moves along a straight line is defined by $s = t^3-6t^2-15t+40$, where s is measured in m and t is in sec. Determine: (14M)

(a) time at which the velocity will be zero
(b) the position and distance travelled by the particle at that time
(c) the acceleration of the particle at that time
(d) the distance travelled by the particle when t= 4 sec to 6 sec.

Or

8 a) A particle, starting from rest, moves in a straight line and its acceleration is given by $a=50 - 36t^2$ m/sec^2 where t is in sec. Determine the velocity of the particle when it has travelled 52m. (7M)

b) Define the terms: (i) velocity of projection (ii) angle of projection (iii) time of flight. (7M)

9 a) On a straight road, a smuggler's car passes a police station with a uniform velocity of 10 m/sec. After 10 seconds, a police party follows in pursuit in a jeep with a uniform acceleration of 1 m/sec^2, find the time necessary for the jeep to catch up with the smugglers car. (10M)

b) State the principle of impulse and momentum for a particle. (4M)

Or

10 a) Write down the equation of principle of work and energy for a rigid body. (7M)

b) Two masses 8 kgs and 3 kgs are initially at rest in the position shown in Figure. .determine the speed of 8 kg block as it hits the ground .neglect the friction at the pulley. (7M)