Course Code: 2020111 Roll No: **MLRS- R20**

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
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I B.Tech II Sem Regular/Supply End Examination, September 2022

Engineering Mechanics

(Civil Engineering)

Time: 3 Hours. **Max. Marks: 70**

Note: 1. Question paper consists: Part-A and Part-B.
2. In Part – A, answer all questions which carries 20 marks.
3. In Part – B, answer any one question from each unit.
Each question carries 10 marks and may have a, b as sub questions.

PART- A

(10*2 Marks = 20 Marks)

1. a)	State Law of Superposition.	2M	CO1	BL1
b)	State Lami's theorem.	2M	CO1	BL1
c)	What is cone of friction?	2M	CO2	BL2
d)	State the Laws of friction	2M	CO2	BL1
e)	Differentiate between Centroid and Center of gravity.	2M	CO3	BL2
f)	State Parallel axis theorem.	2M	CO3	BL1
g)	Explain the significance of tangential and normal acceleration.	2M	CO4	BL3
h)	Write a short note on work and energy.	2M	CO4	BL2
i)	Explain the significance of D'Alemberts principle.	2M	CO5	BL2
j)	What is general plane	2M	CO5	BL1

PART- B

(10*5 Marks = 50 Marks)

2 a)	Find the magnitude and direction of the force F to be added to the system of coplanar concurrent forces shown in figure 1 to maintain equilibrium.	5M	CO1	BL3

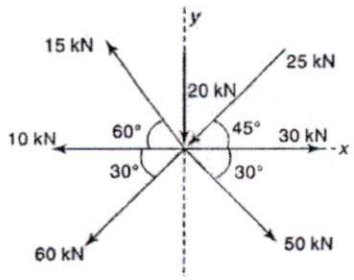

Figure.1

b)	A ball of weight Q=55 N rests in a trough, as shown in figure.2. Determine the forces exerted on the sides of the trough B and C. if all surfaces are perfectly smooth.	5M	CO1	BL3

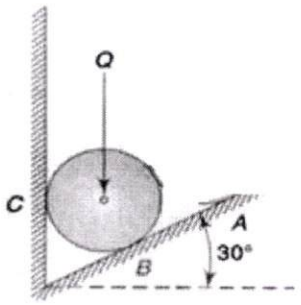

Figure.2.

OR

3	Two rollers of weights P and Q are connected by a flexible string DE and rest on a two mutually perpendicular planes AB & BC as shown in figure 3. Find the tension in the string and angle γ that it makes with the horizontal when the system is in equilibrium consider the following data as P=267N, Q=445N, $\alpha=30^0$ assume the planes are perfectly smooth.	10M	CO1	BL3

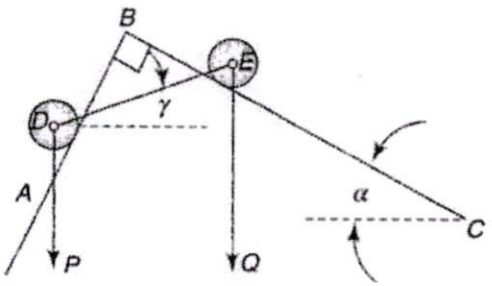

Figure.3.

4	A short semicircular right cylinder of radius r and weight W rests on a horizontal surface and is pulled at right angles to its geometric axis by a horizontal force P applied at the middle B of the front edge as shown in figure 4. Find the angle α that the flat face will make with the horizontal plane just before the sliding begins if the coefficient of friction at the line of contact is μ.	10M	CO2	BL3

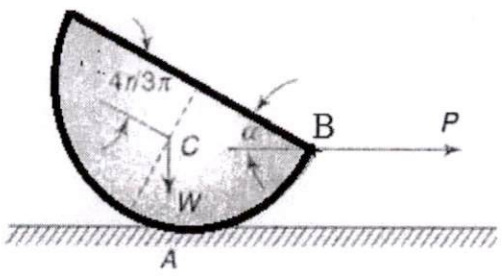

Figure.4.

OR

5	A block of weight W_1 = 200 N rests on a horizontal surface and supports on top of it another block of weight W_2= 50 N the block W_2 attached with vertical wall by a string AB, is shown in figure 5. Find the amount of horizontal force P, applied to the lower block necessary for impending slipping. The coefficient of static friction for all contiguous surfaces is μ=0.3.	10M	CO2	BL3

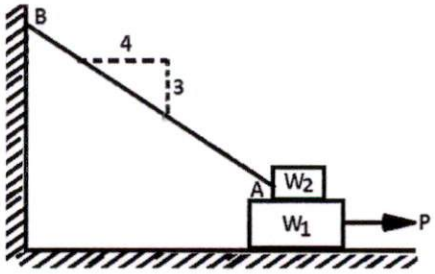

Figure.5.

6	a)	Differentiate between centroid and centre of gravity.	5M	CO3	BL2
	b)	Find the centroid of the Z section shown in Figure 6.	5M	CO3	BL3

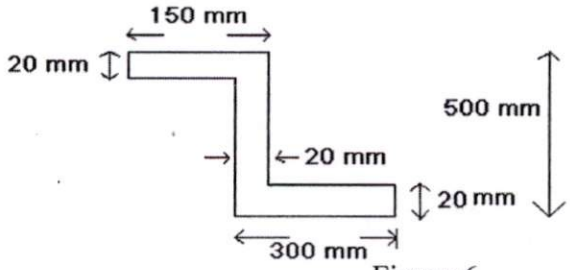

Figure.6.

OR

7		A uniform lamina shown in Figure.7. consists of a rectangle, a circle and a triangle. Determine the centre of gravity of the lamina. All dimensions are in mm.	10M	CO3	BL3

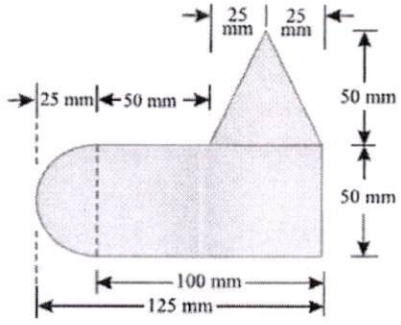

Figure.7.

8	a)	Determine the moments of inertia of the section shown in figure 8 about horizontal and vertical axes passing through the centroid of the section.	5M	CO4	BL3

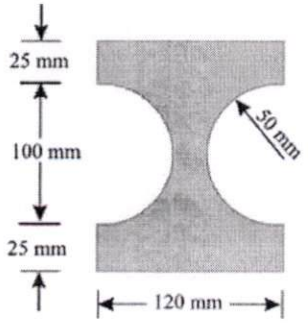

Figure.8.

	b)	Deduce an equation for moment of inertia of right circular solid cone about its generating axes of base radius 'R' and altitude 'h'.	5M	5M	BL2

OR

9	a)	Find the moment of inertia of shaded area shown in Figure 8, below about centroidal axes.	5M	CO4	BL3

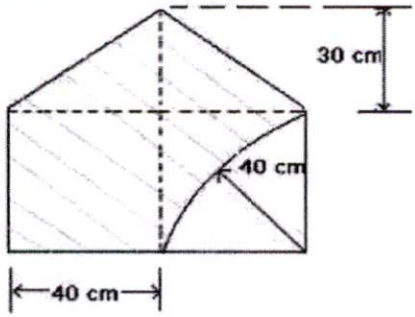

Figure.9.

	b)	Find the mass moment of inertia of a hollow sphere with respect to a diameter if the mass per unit volume of the material is ρ and the outer and inner radii are R_o and R_i, respectively.	5M	CO4	BL2
10	a)	A stone is dropped from the top of a tower 50 m high. At the same time, another stone is thrown upwards from the foot of the tower with a velocity of 25 m/s. When and where the two stones cross each other?	5M	CO5	BL4
	b)	Define work energy principle. Also derive the equation for work energy.	5M	CO5	BL2

OR

11		A small car of weight W starts from rest at A and rolls without friction along the loop ACBD as shown in figure 10. What is the least height h above the top of the loop at which the car can start without falling off the track at point B, and for such a starting position what velocity will the car have along a horizontal portion CD of the track? Neglect friction.	10M	CO5	BL4

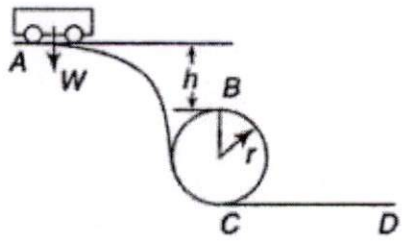

Figure.10.

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