U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2025 Semester End Main Examinations

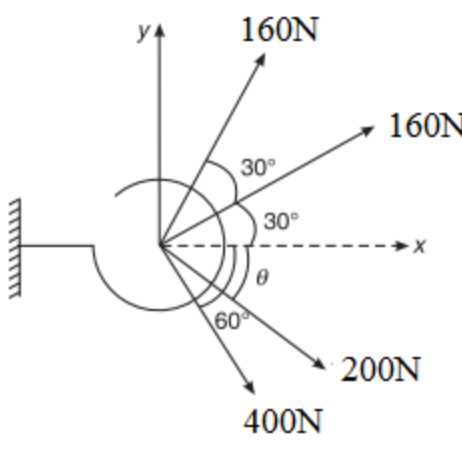**Programme: B.E.** **Semester: I**

Branch: Civil Engineering **Duration: 3 hrs.**

Course Code: 23CV1ESENM **Max Marks: 100**

Course: Engineering Mechanics

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

<table>
<tr><td colspan="3" align="center">UNIT - I</td><td>CO</td><td>PO</td><td>Marks</td></tr>
<tr><td>1</td><td>a)</td><td>Explain the classification of force systems, Explain Moment and couple.</td><td>CO1</td><td>PO1, PO2</td><td>8</td></tr>
<tr><td></td><td>b)</td><td>Explain: Principle of Transmissibility, free body diagram, resolution and composition of a force</td><td>CO1</td><td>PO1, PO2</td><td>4</td></tr>
<tr><td></td><td>c)</td><td>Derive the parallelogram Law of Forces.</td><td>CO1</td><td>PO1, PO2</td><td>8</td></tr>
<tr><td colspan="3" align="center">OR</td><td></td><td></td><td></td></tr>
<tr><td>2</td><td>a)</td><td>Determine the resultant and direction of the resultant of a force system shown in Fig.1

Fig1</td><td>CO1</td><td>PO1, PO2</td><td>10</td></tr>
<tr><td></td><td>b)</td><td>Determine the resultant, position, x-intercept and y-intercept of the resultant of a force system about point 'O' shown in Fig.2 Moments and grid of forces.</td><td>CO1</td><td>PO1, PO2</td><td>10</td></tr>
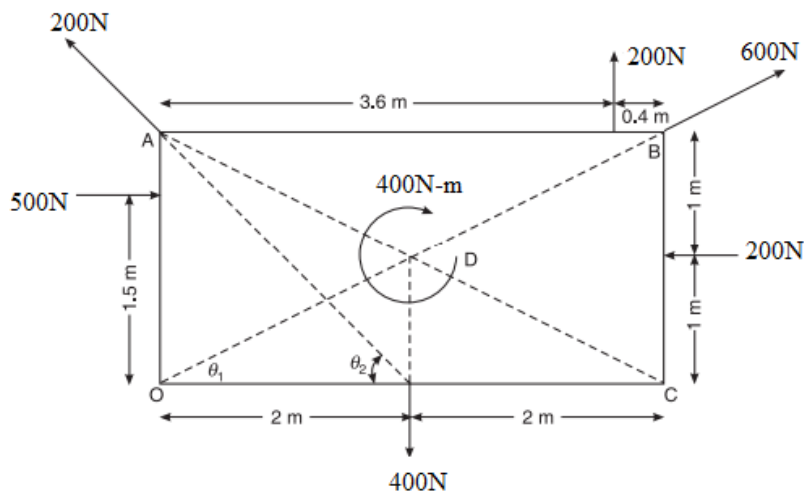</table>

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

Fig2

UNIT - II

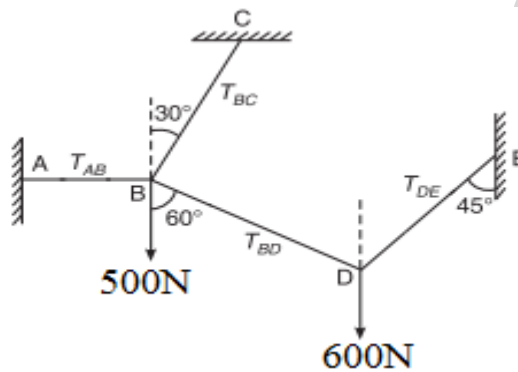|					
3	a)	Determine the forces in the cables shown in Fig.3 .	CO1	PO1, PO2	**10**

Fig3

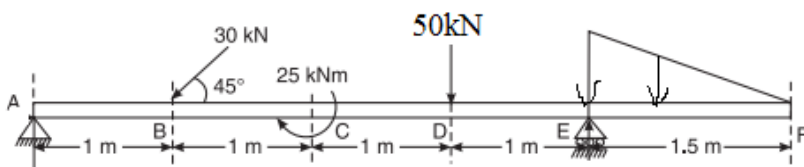|					
	b)	Determine the support reactions in the beam shown in Fig.4. The intensity varying load at support E is 20 kN/m.	CO1	PO1, PO2	**10**

Fig4

OR

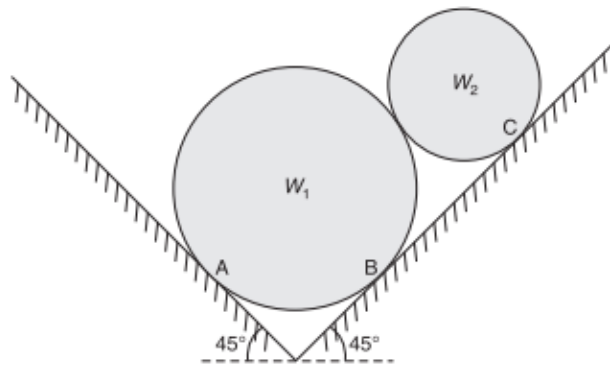|					
4	a)	Determine the reactions at the points of contact in Fig5. Weights - W1 = 75N, W2 = 10N, corresponding radius r1 = 425mm, r2 = 125mm respectively.	CO1	PO1, PO2	**10**

Fig5

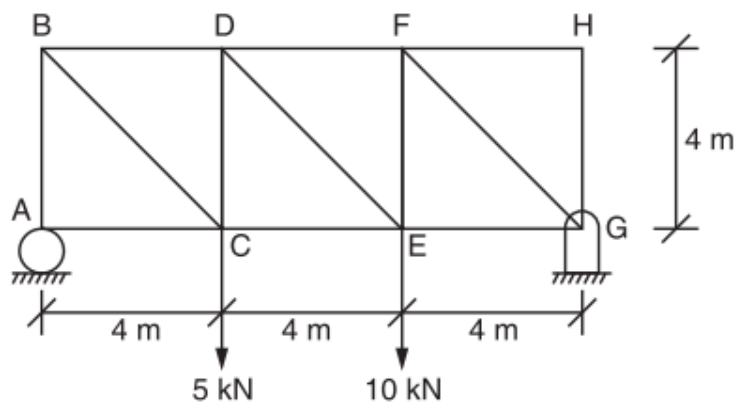| | b) | Briefly explain method of section of trusses. Determine the forces in the truss members BD, CD and CE shown in Fig.6 by method of sections. Fig6 | *CO1* | *PO1, PO2* | **10** |

UNIT – III

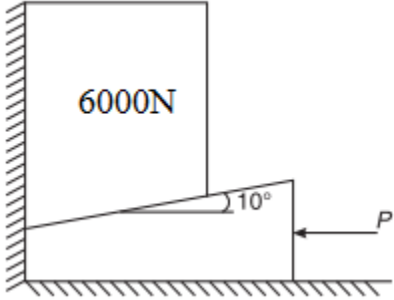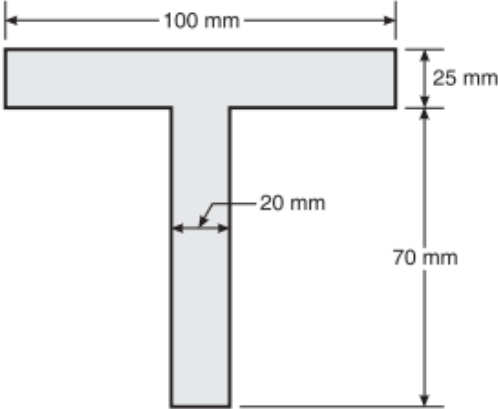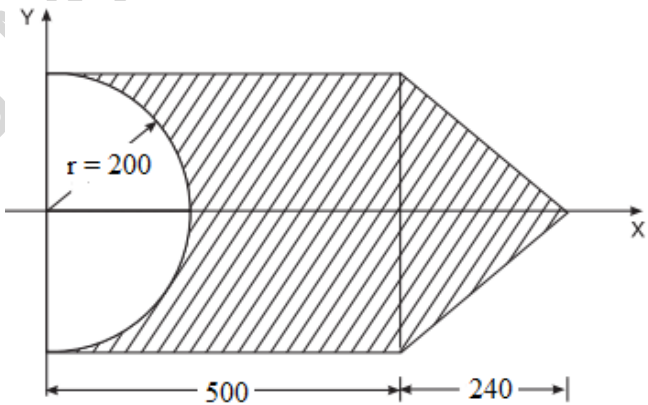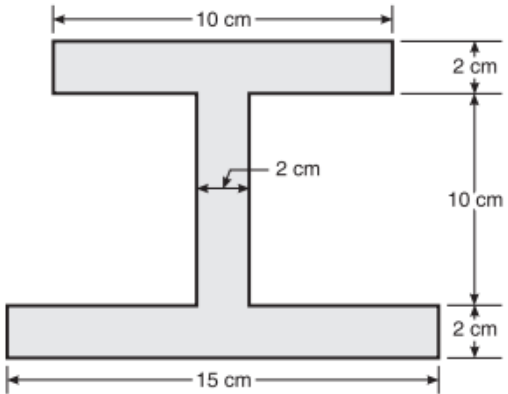| 5 | a) | Explain types of friction. Explain the laws of static and dynamic friction. | *CO2* | *PO1, PO2* | **10** |
| | b) | Determine the force P shown in Fig 7 . Co-efficent of friction is 0.3. Fig7 | *CO2* | *PO1, PO2* | **10** |
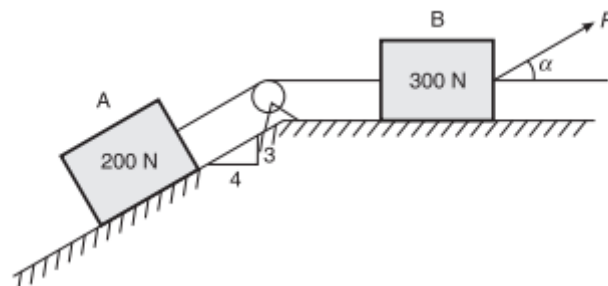
OR

| 6 | a) | A uniform ladder of weight 1700 N and of length 12 m rests on a horizontal ground and leans against a smooth vertical wall. The angle made by the ladder with the horizontal is 65°. When a man of weight 1400 N stands on the ladder at a distance of 8 m from the top of the ladder, the ladder is at the point of sliding. Determine the coefficient of friction between the ladder and the floor. | *CO2* | *PO1, PO2* | **10** |

| | | b) | Determine the value of force P, just required to lift 6000 N up. The angle of friction between block and the wall is 15° and for other surfaces it is 18°.

 Fig8 | CO2 | PO1, PO2 | **10** |

UNIT - IV

7	a)	Derive the centroid of a quarter of a circle that has a radius 'R'.	CO3	PO1, PO2	**10**
	b)	Determine the moment of inertia of the shape shown in Fig 9. Fig9	CO3	PO1, PO2	**10**

OR

| 8 | a) | Determine the centroid of the shape shown in Fig 10.

 Fig10 | CO3 | PO1, PO2 | **10** |

				CO3	PO1, PO2	10
		b)	Determine the moment of inertia of the shape shown in Fig 11.			

Fig11

			UNIT - V			
	9	a)	Explain: Kinematics, Kinetics, Displacement, speed, velocity, acceleration.	CO3	PO1,PO2	06
		b)	A driver of a car travelling at a speed of 144 km/h observes the light 300 m ahead of him turning red. The traffic light is timed to remain red for 40 s before it turns to green. If the motorist wishes to pass the light without stopping to wait for it to green. Determine (i) Required uniform acceleration of car (ii) The speed with which the motorist crosses the traffic light.	CO3	PO1,PO2	07
		c)	A bullet is from a gun with a initial velocity of 500 m/s to hit a target. The target is located at a horizontal distance of 7500 m and 1250 m above the gun (point of projection). Determine the minimum of angle of projection so that the bullet will hit the target.	CO3	PO1,PO2	07
			OR			
	10	a)	A car and truck are both travelling at a constant speed of 45 km/h. Car is 20 m behind the truck. The truck driver suddenly applies his brakes, causing the truck to decelerate at a constant rate at 4 m/s^2. Two seconds later the driver of car applied his brakes and just manages to avoid rear end collision. Determine the constant rate at which the car decelerated.	CO3	PO1,PO2	10
		b)	A toy missile is projected with an initial velocity of 40 m/s. If the missile lands 30 m away at the same level, what is the angle of projection?	CO3	PO1,PO2	10

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