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 / II**
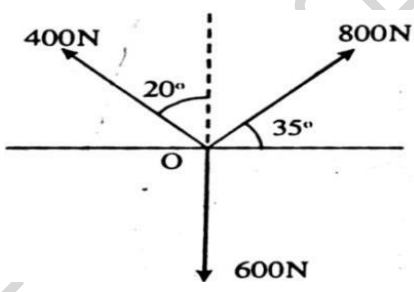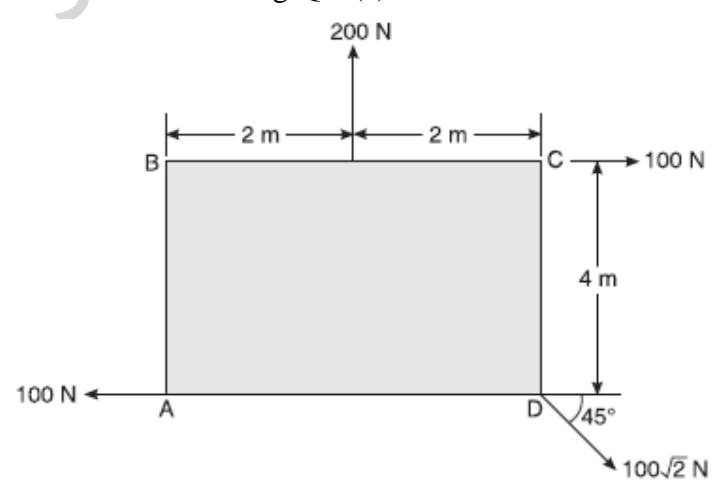
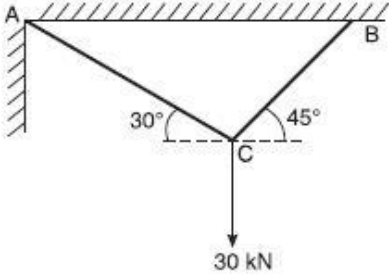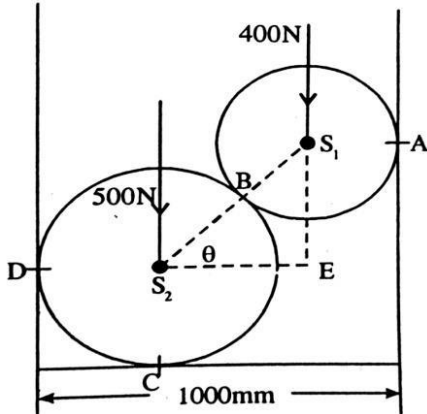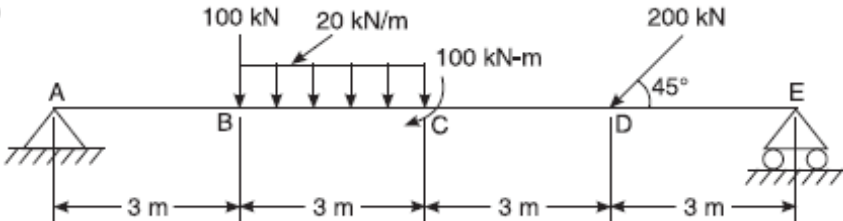**Branch: Common to all Branches**   **Duration: 3 hrs.**

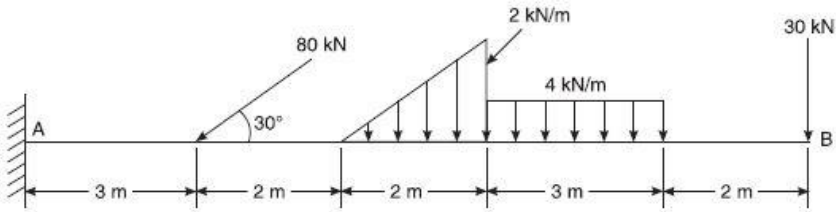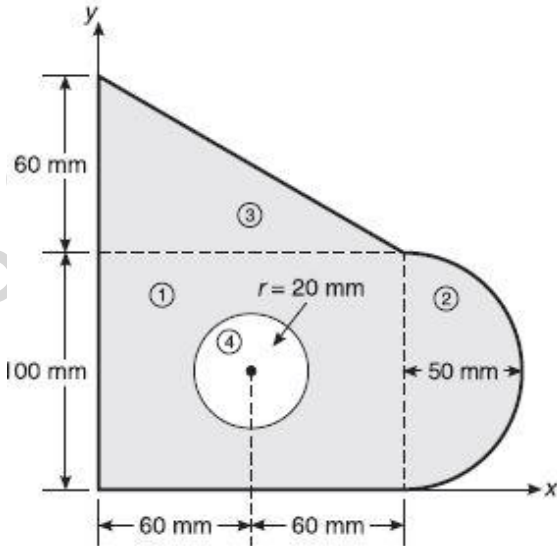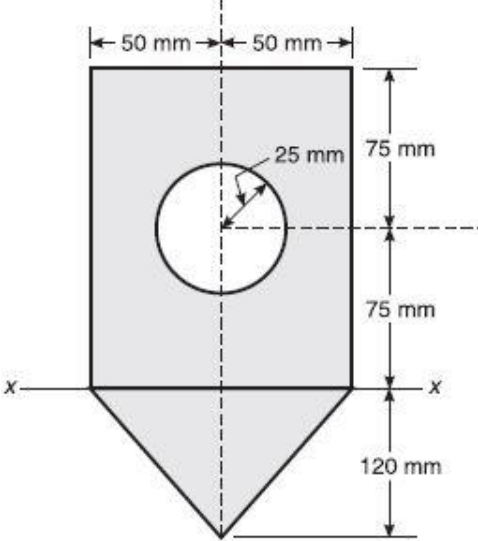**Course Code: 21CV1ESECM / 21CV2ESECM**   **Max Marks: 100**
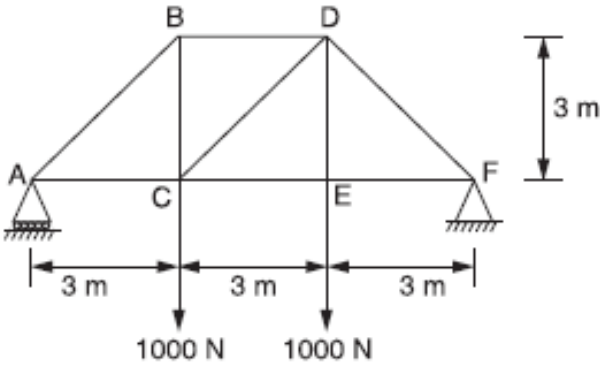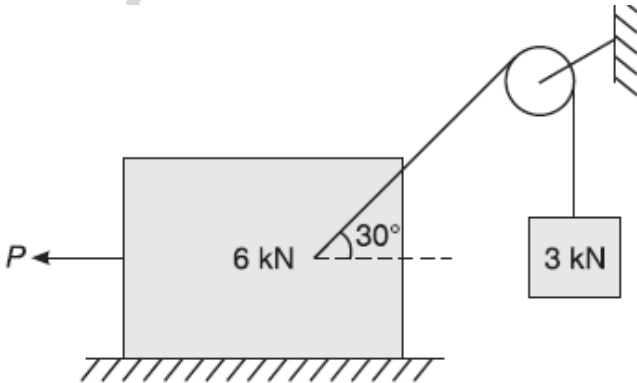
Course: Elements of Civil Engineering and Engineering Mechanics
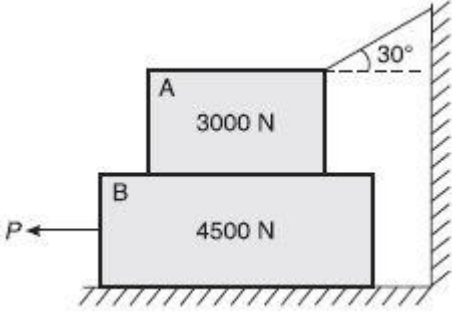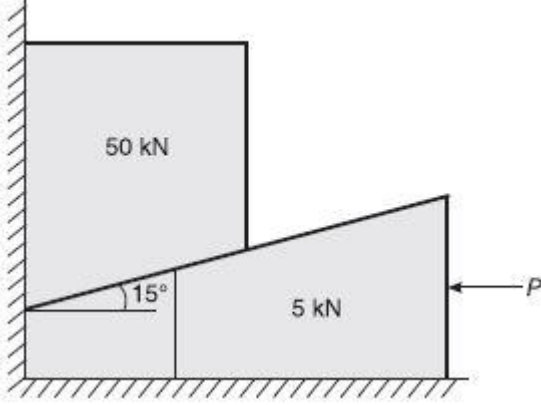
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

			UNIT - I	CO	PO	Marks
1	a)		State and explain the principle of transmissibility of a force.	CO1	PO1	**04**
	b)		Determine the magnitude and direction of the resultant for the coplanar concurrent force system shown in the Fig.Q.1 (b).	CO1	PO1	**06**

Fig.Q.1 (b).

	c)		Determine the magnitude, direction and position of the resultant force with reference to the point A for the non-coplanar force system shown below in Fig.Q.1 (c).	CO1	PO1	**10**

Fig.Q.1 (c).

OR

2	a)	Define couple and list the characteristics of couple.	CO1	PO1	05
	b)	Two cables are connected at A and B as shown in Fig.Q.2 (b). Determine the forces in the cables CA and CB.	CO1	PO1	05
		 Fig.Q.2 (b).			
	c)	Determine the reactions at all contact points for a horizontal channel with an inner clearance of 1000mm. It carries two spheres of radius 350mm and 250mm whose weights are 500N and 400N respectively as shown in Fig.Q.2 (c). Assume all contact surfaces to be smooth. Fig.Q.2 (c).	CO1	PO1	10
		UNIT - II			
3	a)	List the types of beams with sketches.	CO2	PO2	05
	b)	Determine the reactions at A and B for the beam shown in Fig.Q.3 (b). Fig.Q.3 (b).	CO2	PO2	10
	c)	Differentiate between statically determinate and indeterminate beams with sketches	CO2	PO2	05
		OR			

	4	a)	Analyse by the method of joints for the truss shown in Fig.Q.4 (a).	CO2	PO2	10
			Fig.Q.4 (a).			
		b)	Calculate the reactions for the beam shown in Fig.Q.4 (b).	CO2	PO2	10
			Fig.Q.4 (b).			
			UNIT - III			
	5	a)	Find the centroid w.r.t given axis as shown in Fig.Q.5 (a).	CO2	PO2	10
			Fig.Q.5 (a).			
		b)	Distinguish between centroid and centre of gravity.	CO2	PO2	03
		c)	Develop an expression for centroid of Quarter circle.	CO2	PO2	07
			OR			
	6	a)	State and prove parallel axes theorem of moment of inertia	CO2	PO2	04

		b)	Develop an expression for moment of inertia for Rectangle.	*CO2*	*PO2*	**06**
		c)	Determine the moment of inertia of the plane lamina as shown in Fig.Q.6 (c) about the x-axis.	*CO2*	*PO2*	**10**

Fig.Q.6 (c)

UNIT - IV

7	a)	Explain the following terms: (i) Angle of friction (ii) Coefficient of friction (iii) Angle of Repose	*CO2*	*PO2*	**06**
	b)	A block weighing 6 kN is attached to a string as shown in Fig.Q.7 (b), which passes over a frictionless pulley and supports a weight of 3 kN, when the coefficient of friction between the block and the floor is 0.35. Determine the value of force P when the (i) motion is impending towards right. (ii) motion is impending towards left.	*CO2*	*PO2*	**06**

Fig.Q.7 (b)

	c)	A ladder 5 m long rests on a horizontal ground and leans against a smooth wall at an angle of 70° with the horizontal. The weight of the ladder is 900 N and a man weighing 750 N stands on the ladder 1.5 m from the bottom of the ladder. Calculate the coefficient of friction between the ladder and the ground.	*CO2*	*PO2*	**08**

OR

8	a)	State the laws of dry friction.	*CO2*	*PO2*	**04**
	b)	A block weighing 4500 N resting on horizontal surface supports another block of 3000 N as shown in Fig.Q.8 (b). Find the horizontal force P required to just move the block to the left. Take the coefficient of friction for all contact surfaces as 0.3.	*CO2*	*PO2*	**06**

Fig.Q.8 (b).

	c)	Determine the force P required to start the movement of the wedge as shown in Fig.Q.8 (c). Take μ = 0.2 for all contact surfaces.	*CO2*	*PO2*	**10**

Fig.Q.8 (c).

		UNIT - V			
9		Describe briefly (i) Structural engineering (ii) Geotechnical Engineering (iii) Environmental engineering.	*CO3*	*PO7*	**20**
		OR			
10		Explain in detail the role of civil engineers in earthquake engineering and transportation engineering.	*CO3*	*PO7*	**20**

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