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/II**

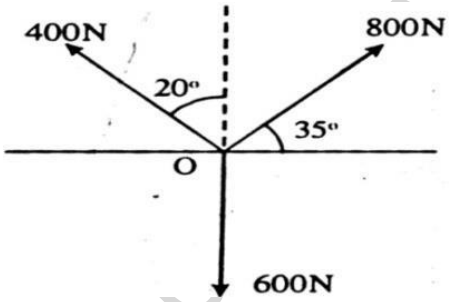
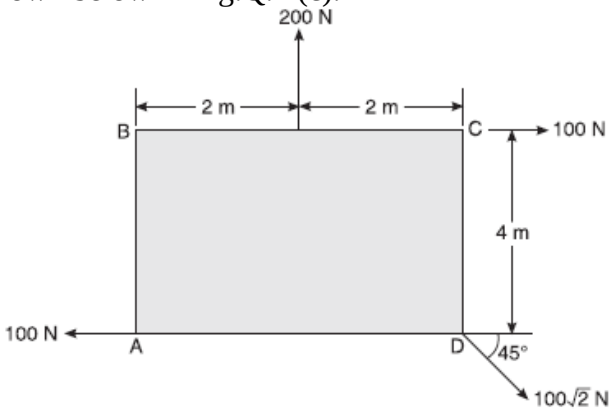
Branch: Common to all Branches **Duration: 3 hrs.**

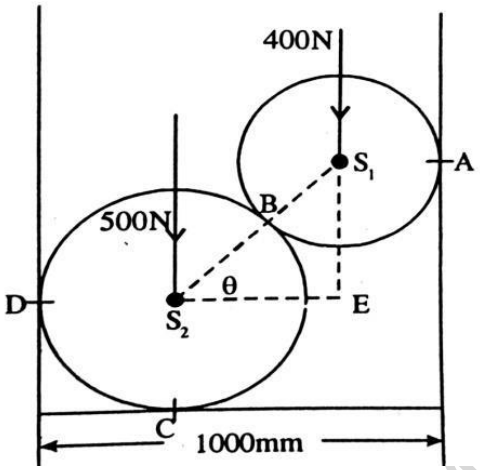
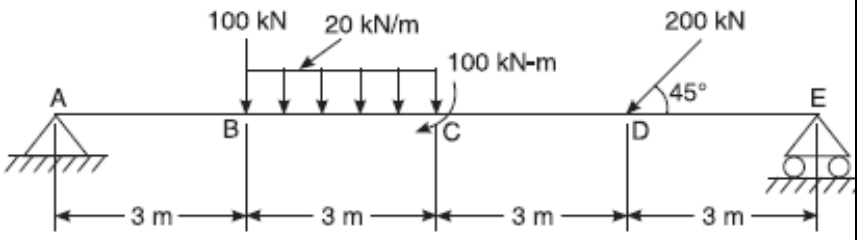
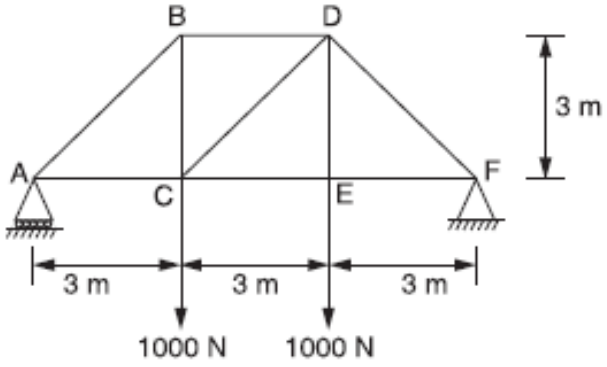
Course Code: 18CV1ESENM / 18CV2ESENM **Max Marks: 100**

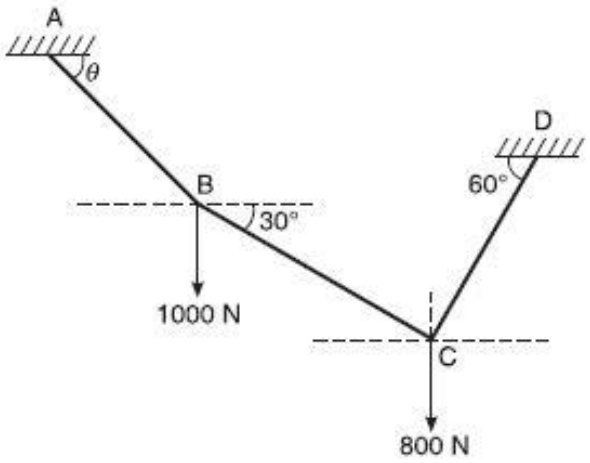
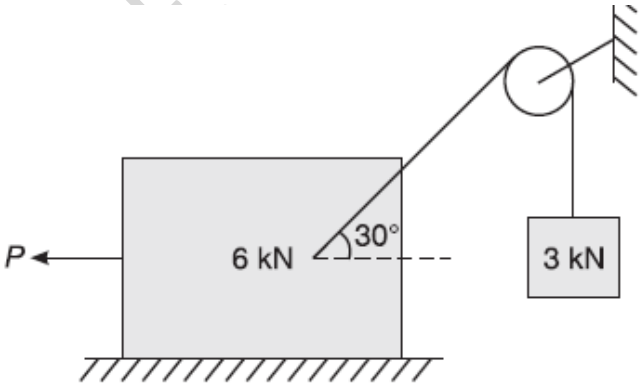
Course: ENGINEERING MECHANICS

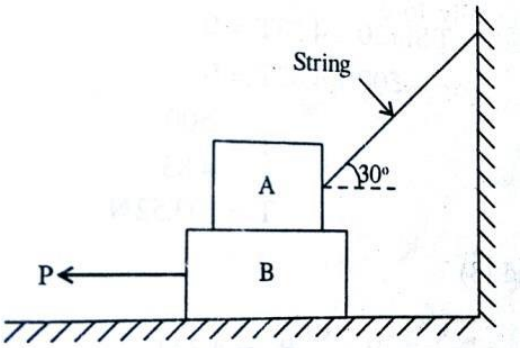
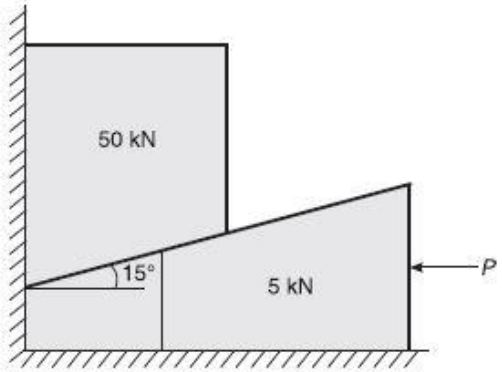
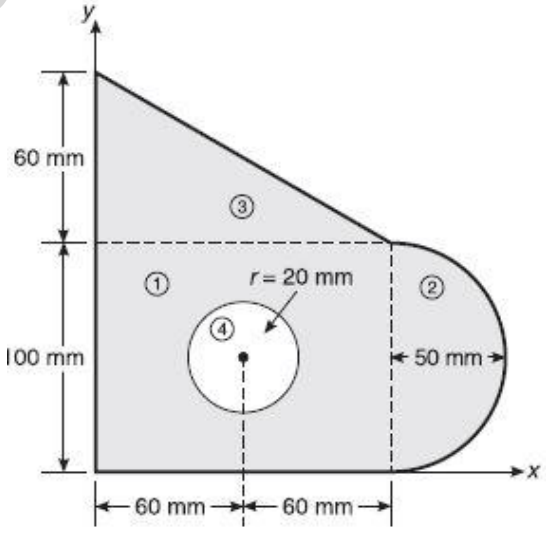
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

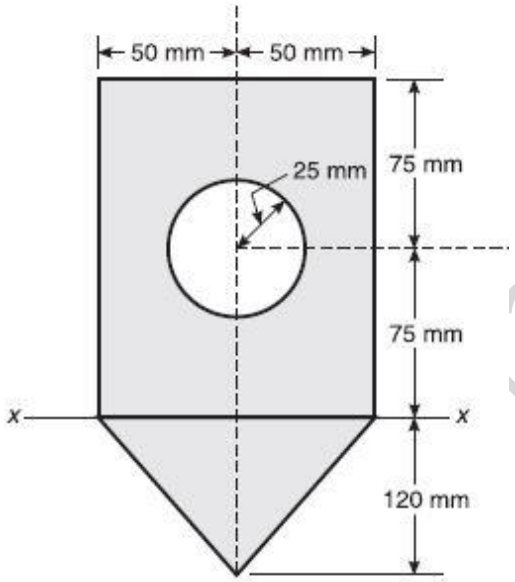
Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Explain different types of force system with neat sketches.	CO1	PO1	08
	b)	Determine the magnitude and direction of the resultant for the coplanar concurrent force system shown in the Fiq.Q.1 (b).  Fiq.Q.1 (b).	CO1	PO1	08
	c)	State and explain the principle of transmissibility of a force.	CO1	PO1	04
		OR			
2	a)	Define couple and list the characteristics of couple.	CO1	PO1	05
	b)	Distinguish between resolution and composition of forces.	CO1	PO1	05
	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.2 (c).  Fig.Q.2 (c).	CO1	PO1	10

			UNIT - II			
	3	a)	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.3 (a). Assume all contact surfaces to be smooth.  Fig.Q.3 (a).	***CO2***	***PO1***	**08**
		b)	Determine the support reactions for the beam shown in Fig.Q.3 (b).  Fig.Q.3 (b).	***CO2***	***PO1***	**08**
		c)	State and explain Lami's theorem with a neat sketch.	***CO2***	***PO1***	**04**
			OR			
	4	a)	Analyse by the method of joints for the truss shown in Fig.Q.4 (a).  Fig.Q.4 (a).	***CO2***	***PO1***	**10**

		b)	Compute the tensions in the strings AB, BC and CD as shown in Fig.Q.4 (b).  Fig.Q.4 (b).	***CO2***	***PO1***	**06**
		c)	List the types of supports with sketches.	***CO2***	***PO1***	**04**
			UNIT - III			
	5	a)	Explain the following terms: (i) Angle of friction (ii) Coefficient of friction (iii) Angle of Repose	***CO2***	***PO1***	**06**
		b)	A block weighing 6 kN is attached to a string as shown in Fig.Q.5 (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.  Fig.Q.5 (b)	***CO2***	***PO1***	**06**
		c)	A uniform ladder of 4 m length rests against a vertical wall with which it makes an angle of 45° with horizontal. The coefficient of friction between the ladder and the wall is 0.4 and that between the ladder and the floor is 0.5. If the man whose weight is one-half of that of ladder ascends it, how high will he be when the ladder slips.	***CO2***	***PO1***	**08**
			OR			

	6	a)	State the laws of dry friction.	***CO2***	***PO1***	**04**
		b)	Find the force P just required to slide the block B in the arrangement shown in the Fig.Q.6 (b). Take, weight of block A = 150N and weight of block B = 200N and coefficient of friction (μ) = 0.2 for all contact surfaces.  Fig.Q.6 (b).	***CO2***	***PO1***	**06**
		c)	A block of weight 50 kN is kept in equilibrium, by a wedge as shown in Fig.Q.6 (c). If the coefficient of friction is 0.2 for all the surfaces and the wedge has a weight of 5 kN, determine the force P necessary to cause a tendency in the block to move up.  Fig.Q.6 (c).	***CO2***	***PO1***	**10**
			UNIT - IV			
	7	a)	Find the centroid w.r.t given axis as shown in Fig.Q.7 (a).  Fig.Q.7 (a).	***CO2***	***PO1***	**10**

		b)	Distinguish between centroid and centre of gravity.	*CO2*	*PO1*	**03**
		c)	Develop an expression for centroid of Quarter circle.	*CO2*	*PO1*	**07**
			OR			
	8	a)	State and prove parallel axes theorem of moment of inertia.	*CO2*	*PO1*	**05**
		b)	Develop an expression for moment of inertia for Rectangle.	*CO2*	*PO1*	**05**
		c)	Determine the moment of inertia of the plane lamina as shown in Fig.Q.8 (c) about the x-axis.  Fig.Q.8 (c)	*CO2*	*PO1*	**10**
			UNIT - V			
	9	a)	Explain the following terms briefly: (i) Angle of projection (ii) Horizontal range (iii) Vertical height (iv) Time of flight	*CO3*	*PO2*	**06**
		b)	Derive the equation for the path of a projectile.	*CO3*	*PO2*	**06**
		c)	A particle is projected in air with a velocity of 100 m/s at an angle of 30° with horizontal. Find the horizontal range, maximum height attained and time of flight.	*CO3*	*PO2*	**08**
			OR			
	10	a)	State and explain D 'Alembert's principle of dynamic equilibrium.	*CO3*	*PO2*	**06**
		b)	A bullet is fired from a gun with an initial velocity of 250m/sec to hit a target at a horizontal distance of 3750m and 625m above the gun. Determine the minimum angle of projection so that the bullet will hit the target.	*CO3*	*PO2*	**08**
		c)	Derive the expression for banking of roads with usual notations.	*CO3*	*PO2*	**06**

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