U.S.N.										

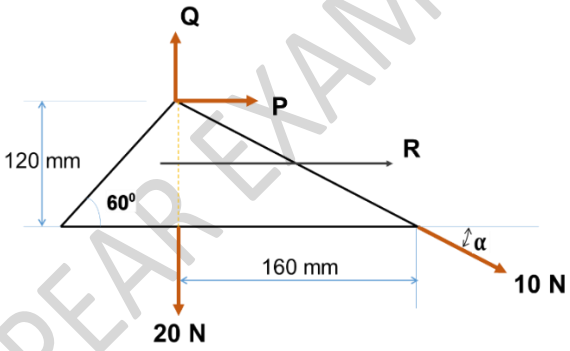
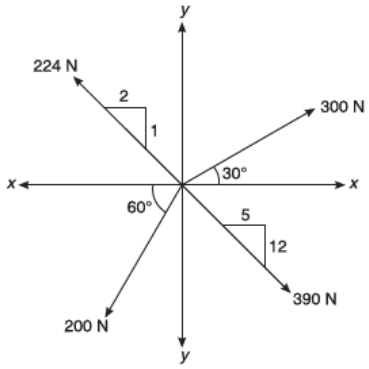
B.M.S. College of Engineering, Bengaluru-560019

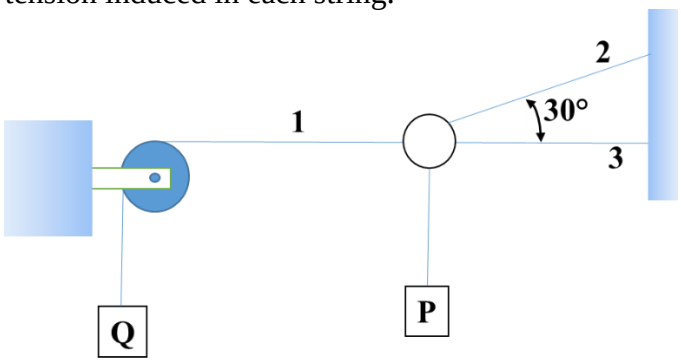
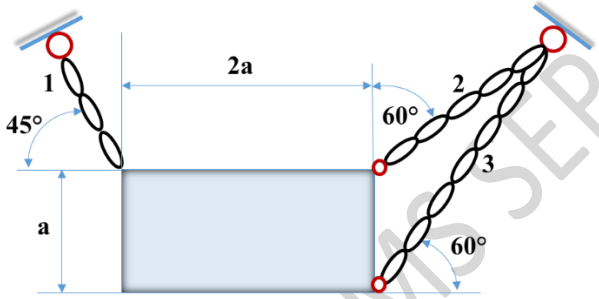
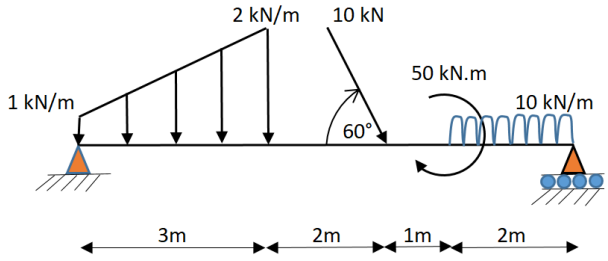
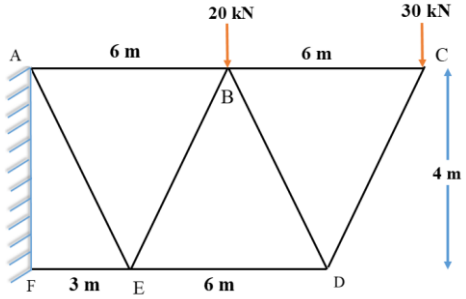
Autonomous Institute Affiliated to VTU

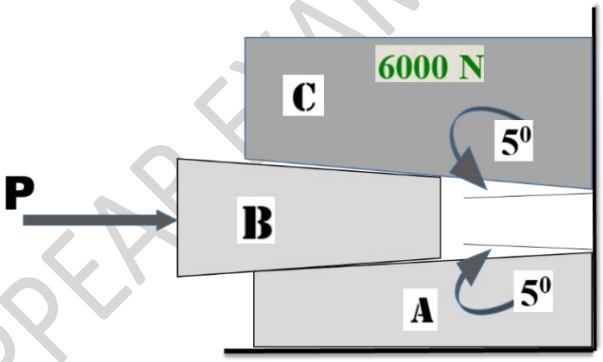
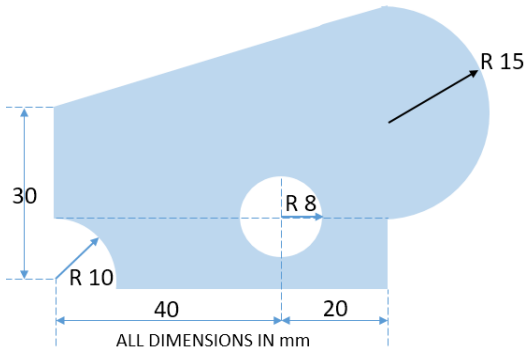
September 2024 Supplementary Examinations

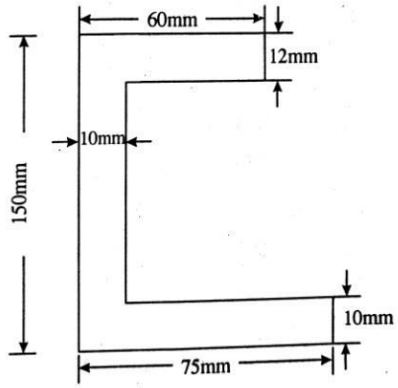
Programme: B.E. **Semester: I**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 23CV1ESENM **Max Marks: 100**
Course: Engineering Mechanics

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

		UNIT - I	CO	PO	Marks
1	a)	State and explain 'Triangle law of forces' with a neat sketch.	CO1	PO1	**3**
	b)	Four forces acting on a triangle ABC are shown in figure-1. The sum of moments of these forces at point 'C' is 2000 N-mm clockwise. If resultant of force system is in horizontal direction, find its magnitude and point of application.  Fig-1	CO1	PO1, PO2	**7**
	c)	Determine the resultant of the forces acting on a particle as shown in Fig -2  Fig -2	CO1	PO1, PO2	**10**
		UNIT-II			
2	a)	State and prove Lami's theroem.	CO1	PO1, PO2	**4**

		b)	In the figure-3, weights 'P = 2225 N' and 'Q = 4450 N' are suspended in a vertical plane by strings 1, 2, 3 as shown. Find the tension induced in each string.  Fig-3	*CO1*	*PO1, PO2*	**6**
		c)	The homogenous rectangular slab shown in figure-4 weighs 35 kN. It is suspended by chains 1, 2 and 3. Calculate tensions T1, T2 and T3 in chains 1, 2 and 3 respectively.  Fig-4	*CO1*	*PO1, PO2*	**10**
			OR			
3		a)	Explain the term 'Statically determinate beams' with examples.	*CO1*	*PO1*	**3**
		b)	Determine the support reactions for the beam shown in figure -5  Fig-5	*CO1*	*PO1, PO2*	**7**
		c)	Determine the forces in all the members of the frame shown in figure 6. Indicate the nature of the forces.  Fig-6	*CO1*	*PO1, PO2*	**10**

			UNIT - III			
	4	a)	A ladder 8 m long and weighing 335 N leans against a smooth vertical wall making 50^0 with ground. A firefighter, whose weight is 875 N, stands 6.30m up along the ladder from the bottom of the ladder. Find the forces that the wall and the ground exert on the ladder. Take coefficient of friction between ladder and wall as 0.25 and coefficient of friction between ladder and floor as 0.3. Refer Fig-7.  Fig 7	*CO2*	*PO1, PO2*	**10**
		b)	In the figure-8 shown below, a stone block weighing 6000 N, is raised slightly by means of two wooden wedges A & B with a force P on wedge 'B'. The angle between the contacting surfaces of the wedge is 5^0. If coefficient of friction is 0.3 for all contact surfaces, compute the value of 'P' required to impend upward motion of the block C. Neglect weight of the wedges.  Fig-8	*CO2*	*PO1, PO2*	**10**
			UNIT - IV			
	5	a)	Derive the expression for coordinates of centroid of a quadrant of a circle from first principles.	*CO3*	*PO1*	**6**
		b)	Compute the least radius of gyration for the shaded area shown in figure 8.  Fig-8	*CO3*	*PO1*	**14**

			OR			
	6	a)	Derive the expression for moment of inertia for a right-angled triangle with its reference axis along the height of the triangle.	*CO3*	*PO1*	**6**
		b)	Find the radius of gyration of the area shown in figure-9, about the polar axis passing through centroid  Fig-9	*CO3*	*PO1*	**14**
			UNIT-V			
	7	a)	State and explain D'Alembert's principle.	*CO4*	*PO1*	**4**
		b)	A rocket is projected vertically upward until it is 50 km above the launching site. At this instant, it is turned so that its velocity is directed at 3 upward and 4 horizontal and the power is shut off. At that moment its velocity is 1680 m/sec. The rocket strikes the ground at the same elevation as the launching site. Determine the horizontal distance covered by rocket, and its velocity when it touches the ground.	*CO4*	*PO1*	**8**
		c)	In a police investigation of tyre marks, it was concluded that a car while in motion along a straight level road has skidded for a total of 60 m after the brakes were applied. If the coefficient of friction is 0.45 for tyres and pavement, what was the probable speed of the car just before the brakes were applied? Use D'Alembert's principle	*CO4*	*PO1*	**8**

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