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**

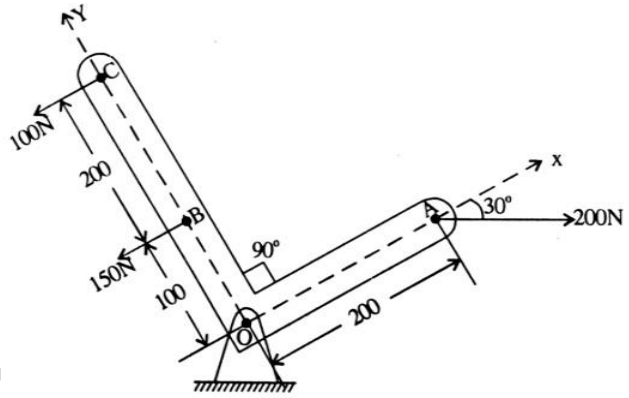
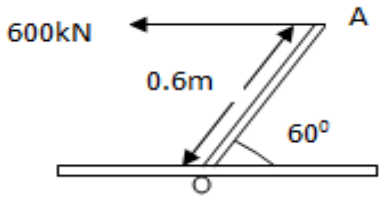
Branch: Civil Engineering **Duration: 3 hrs.**

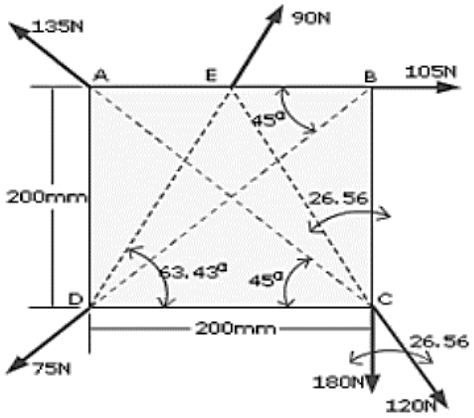
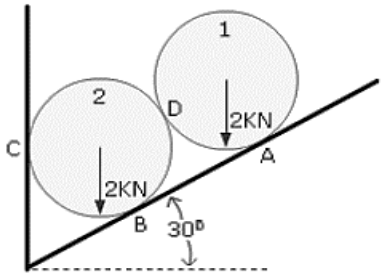
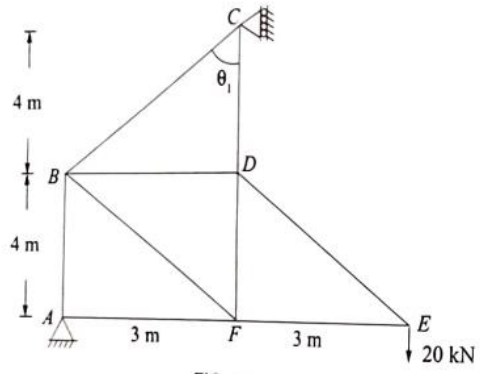
Course Code: 22CV1ESENM **Max Marks: 100**

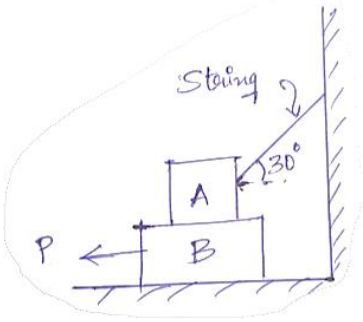
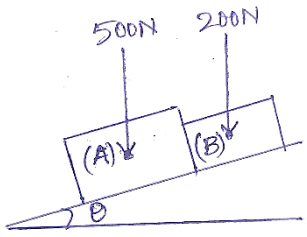
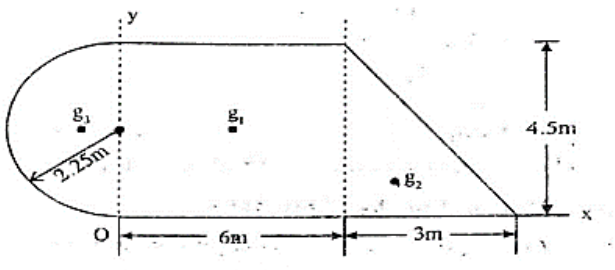
Course: Engineering Mechanics

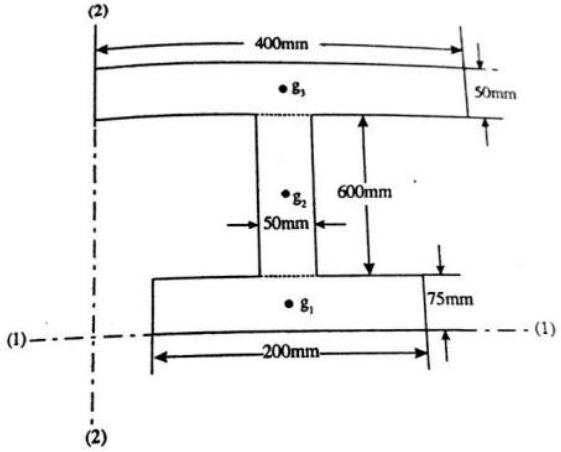
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

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)	State and derive the equation for Law of Parallelogram of forces.	CO1	PO 1,2	**5**
	b)	Distinguish between Resolution and Composition of forces.	CO1	PO1,2	**5**
	c)	Three external forces are acting on L-shaped lever as shown in the Fig-1c. Determine the equivalent system through O as shown.  Fig-1c	CO1	PO1,2	**10**
		OR			
2	a)	Describe the characteristics of a force.	CO1	PO1,2	**5**
	b)	Determine the force couple equivalent at point O for the given Fig-2b.  Fig-2b	CO1	PO1,2	**5**

		c)	Determine the magnitude, direction and position of the resultant force with respect to point C as shown in Fig-2c.  Fig-2c	*CO1*	*PO1, 2*	**10**
			UNIT - II			
	3	a)	Two identical cylinders each weighing 2kN are supported by vertical and inclined plane as shown in Fig-3a. Assuming smooth surfaces determine the reactions at A, B and C  Fig-3a	*CO2*	*PO1, 2*	**10**
		b)	Briefly describe different types of beams.	*CO2*	*PO1,2*	**5**
		c)	Briefly describe different types of loads.	*CO2*	*PO1,2*	**5**
			OR			
	4	a)	Briefly describe the types of trusses	*CO2*	*PO1,2*	**5**
		b)	Analyze the truss shown in the Fig-4b by the method of joints.  Fig-4b	*CO2*	*PO1,2*	**15**

			UNIT - III			
	5	a)	Briefly explain the types of friction	*CO2*	*PO1,2*	**5**
		b)	Explain angle of friction and angle of limiting friction	*CO2*	*PO1,2*	**5**
		c)	Find the force P required to slide the block B in the arrangement shown in the Fig-5c. Determine the tension in the string if $\mu = 0.2$ for all contact surfaces. Weight of block A and B = 500N and 1000N  Fig-5c	*CO2*	*PO1,2*	**10**
			OR			
	6	a)	Determine the maximum angle that can be reached before the bodies slip down the inclination. Take $\mu A = 0.3$ and $\mu B = 0.2$ for the Fig-6a shown below  Fig-6a	*CO2*	*PO1, 2*	**10**
		b)	Explain the laws of dry friction.	*CO2*	*PO1,2*	**10**
			UNIT - IV			
	7	a)	Define centroid, center of gravity and axis of reference	*CO3*	*PO1,2*	**6**
		b)	Locate the centroid of the area shown in figure with respect to the axis shown in Fig-7b.  Fig-7b	*CO3*	*PO1,2*	**14**

			OR			
	8	a)	Derive an equation to locate moment of inertia of a triangle.	*CO3*	*PO1, 2*	**10**
		b)	Find the M.I. along the horizontal axis passing through the centroid of the section shown in Fig-8b  Fig-8b	*CO3*	*PO1, 2*	**10**
			UNIT - V			
	9	a)	Define acceleration due to gravity and derive an expression for the time taken by a freely falling body to reach the ground from a height h.	*CO4*	*PO1, 2*	**10**
		b)	A particle is projected from the ground with an initial velocity of 50 m/s at an angle of 30^0 with the horizontal. Determine: a) Time of flight, b) Maximum height reached and c) Horizontal range.	*CO4*	*PO1, 2*	**10**
			OR			
	10	a)	Using D'Alembert's principle, solve the problem of a block of mass 10 kg sliding down a rough incline at an angle of 30^0 with a coefficient of friction μ=0.2. Determine the acceleration of the block and the time it takes to slide down a 5 m inclined plane.	*CO4*	*PO1, 2*	**10**
		b)	Two blocks of masses 5 kg and 10 kg are connected by a string passing over a frictionless pulley. The 10 kg block is hanging vertically, and the 5 kg block rests on a frictionless horizontal surface. Calculate the acceleration of the system and also find the tension in the string.	*CO4*	*PO1, 2*	**10**

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