CBCS SCHEME

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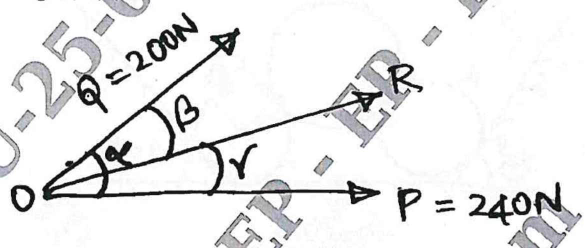
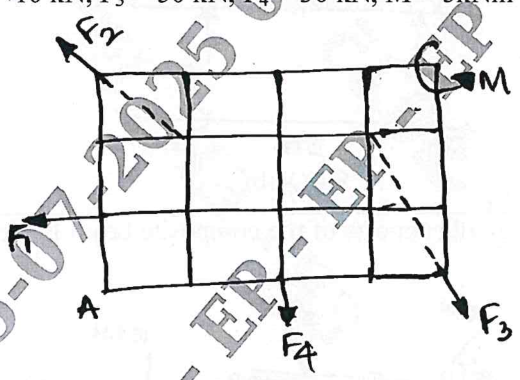
BCIVC103/203

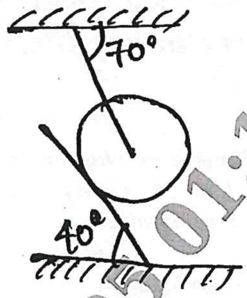
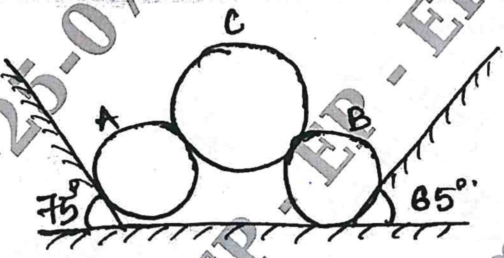
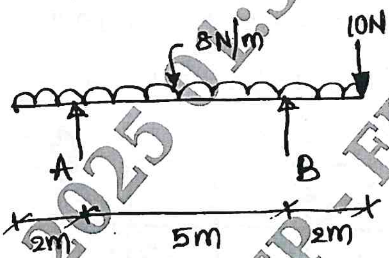
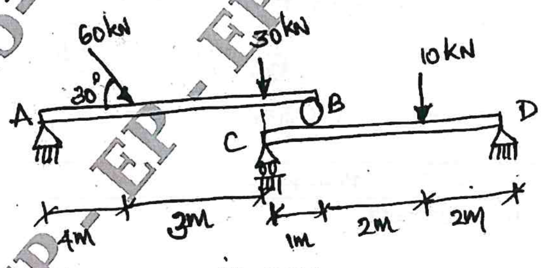
First/Second Semester B.E./B.Tech. Degree Examination, June/July 2025

Engineering Mechanics

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. VTU Formula Hand Book is permitted.

		Module – 1	M	L	C
Q.1	a.	Explain classification of force system with neat sketches.	10	L2	CO1
	b.	Two forces of magnitude 240N and 200N are acting at a point O as shown in Fig Q1(b). If the angle between the forces is 60°, determine the magnitude of the resultant forces. Also, determine the angle β and γ as shown in the Fig Q1(b).  Fig Q1(b)	10	L3	CO1
		OR			
Q.2	a.	State and Prove Varignon's theorem of moments.	10	L2	CO1
	b.	Four forces and a couple are acting on a lamina as shown in Fig Q2(b). Each block is a square of side 1 m. Find the position of resultant with respect to point A. $F_1 = 5$ kN, $F_2 = 10$ kN, $F_3 = 50$ kN, $F_4 = 30$ kN, M = 5kNm  Fig Q2(b)	10	L3	CO1
		Module – 2			
Q.3	a.	State and prove Lami's theorem.	5	L2	CO2

	b.	Find the reactions from the inclined plane and tension in the string for the arrangement shown in Fig Q3(b). Take weight of the ball as 500 N.  Fig Q3(b)	5	L3	CO2
	c.	Determine the reactions at contact points for sphere A, B and C as shown in Fig Q3(c). $W_A = W_B = 4$ kN, $W_C = 6$ kN, $d_A = d_B = 500$ mm, $d_c = 800$ mm.  Fig Q3(c)	10	L3	CO2
		OR			
Q.4	a.	Explain different types of loads with a neat sketch.	5	L2	CO2
	b.	Find the reactions at both the supports for the beam shown below in Fig Q4(b)  Fig Q4(b)	5	L3	CO2
	c.	Find the reactions at all supports of the composite beam loaded as shown in Fig Q4(c).  Fig Q4(c)	10	L3	CO2

Module – 3

Q.5 **a.** Analyze the truss shown in Fig Q5(a), by the method of joints. **10** **L3** **CO3**

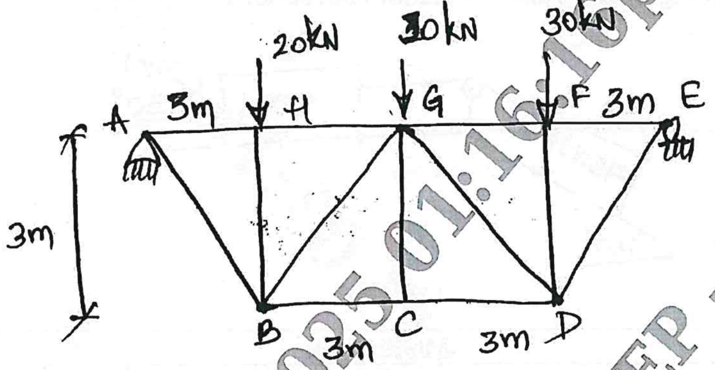


Fig Q5(a)

b. Find the support reactions and forces in members BC, CF, EF and CE of truss as shown in Fig Q5(b). **10** **L3** **CO3**

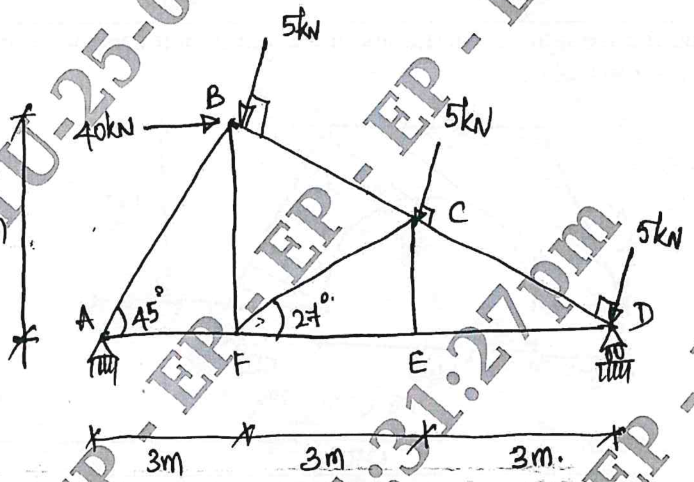


Fig Q5(b)

OR

Q.6 **a.** A block of weight 50 kN is kept in equilibrium by a wedge as shown in Fig Q6(a). If $\mu = 0.2$ for all surfaces and wedge has a weight of 5 kN. Determine the force P necessary to cause a tendency the block to move up. **10** **L3** **CO3**

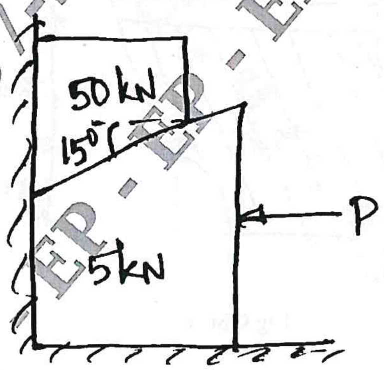
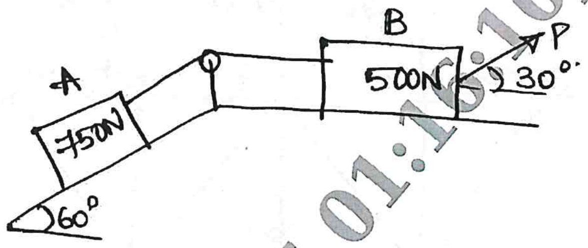
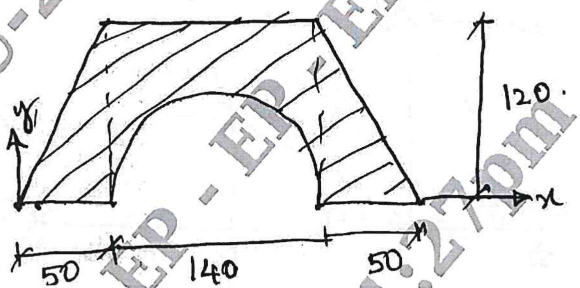
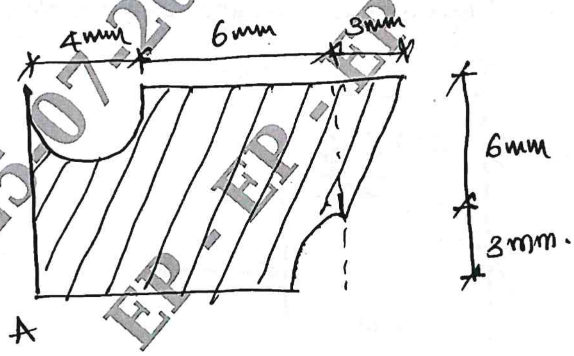
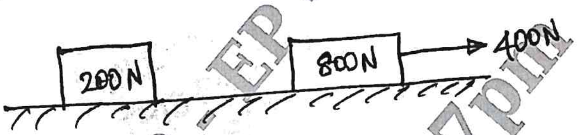


Fig Q6(a)

	b.	What is the minimum value of P in the system such that the 750 N block is lifted in Fig Q6(b). Take $\mu = 0.2$ for both surfaces  Fig Q6(b)	10	L3	CO3
		Module – 4			
Q.7	a.	Define : i) Moment of inertia ii) Radius of gyration iii) Polar moment of inertia.	6	L1	CO4
	b.	Explain perpendicular axis theorem.	4	L2	CO4
	c.	Determine the moment of inertia about the horizontal centroidal axis for Fig Q7(c), show below.  Fig Q7(c)	10	L3	CO4
		OR			
Q.8	a.	Derive an expression for centroid of a semicircle from first principle.	6	L2	CO4
	b.	Explain the following terms : i) Centroid ii) Centroidal axis.	4	L1	CO4
	c.	Locate the centroid of shaded area shown in Fig Q8(c) with respect to point A.  Fig Q8(c)	10	L3	CO4

		Module – 5			
Q.9	**a.**	Define the following : i) Angle of projection ii) Horizontal range iii) Vertical height iv) Time of flight	**8**	**L1**	**CO5**
	b.	A burglar's car starts at an acceleration of 2 m/sec^2. A police vigilant party come after 5 secs and continued to chase the burglar's car with uniform velocity of 20 m/sec. Find the time taken in which the police van will overtake the car.	**12**	**L3**	**CO5**
		OR			
Q.10	**a.**	State D'Alembert's principle and write significance of its structural dynamics.	**8**	**L2**	**CO5**
	b.	Two weights 800 N and 200 N are connected by a thread and they move along a rough horizontal plane under the action of a force of 400 N applied to 800 N weight as shown in Fig Q10(b). The coefficient of friction between sliding surface of the weights and plane is 0.3. Using D'Alembert's principle, determine the acceleration of the weight and tension in the thread.  Fig Q10(b)	**12**	**L3,4**	**CO5**

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