Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Third Semester

Mechanical Engineering

UMET24301 - Engineering Mechanics

(Common to Civil Engineering)

Regulations - 2024

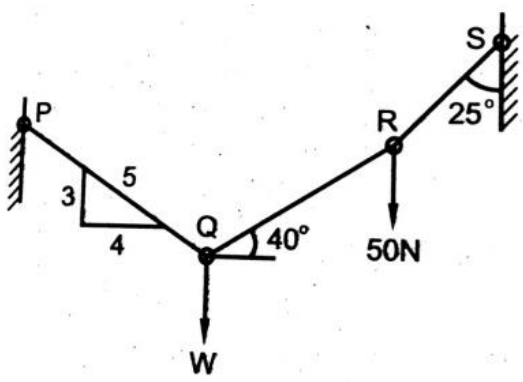
Duration : 3 Hrs *Maximum : 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BTL*	*CO*	*Marks*
1.	Outline the principle of transmissibility.	L1	1	2
2.	A force of magnitude 500N is passing through the origin and a point A (0.2, 1, 0)m. Find the couple form of the force.	L3	1	2
3.	List the types of loads.	L1	2	2
4.	Define the force-couple system.	L1	2	2
5.	Compare centroid and centre of gravity.	L2	3	2
6.	Define the moment of inertia of a rectangular lamina of base 'b' and height 'h' about its base.	L1	3	2
7.	Define limiting friction.	L1	4	2
8.	Relate the angle of friction with block sliding on the rough surface.	L2	4	2
9.	What is impulsive force?	L2	5	2
10.	Define projectile.	L1	5	2

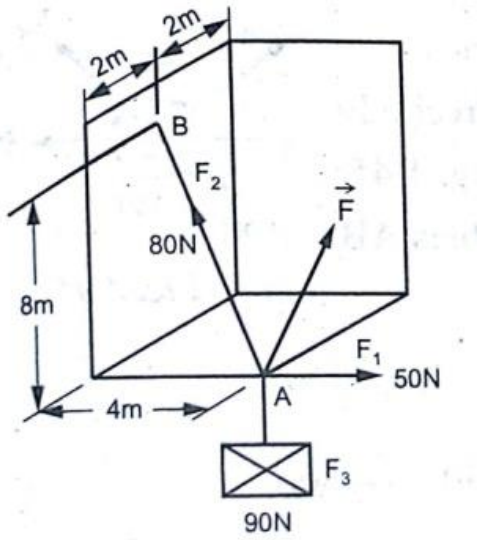
*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a	Extend the analysis to show how a change in the 50 N load would alter W and the forces in PQ, QR and RS; then compute the present W and link forces.	L3	1	16

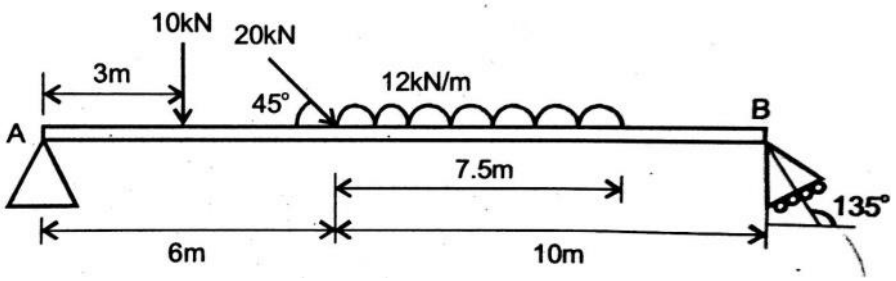


Or

	b	Interpret the three-force system at A to determine the vector F (its magnitude and line of action) that produces equilibrium. An unknown force F, attached to the system makes the particle A in equilibrium. Find the magnitude and direction of the unknown force F.	L3	1	16

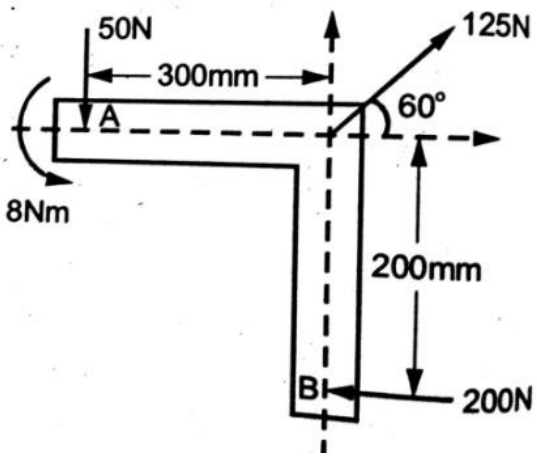


12.	a	Demonstrate, by drawing the free-body diagram and writing equilibrium equations and find the support reactions of the beam loaded as shown in the figure.	L3	2	16

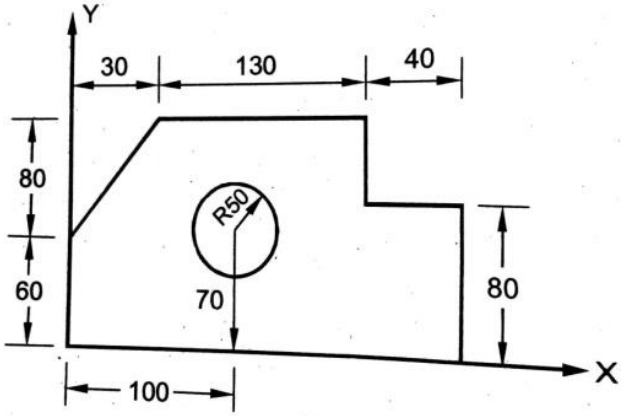


Or

	b	Illustrate the resultant of the three forces and the couple acting on the angle bracket: (1) find the resultant force and moment, and (2) locate the points where the line of action of this resultant intersects the bracket.	L3	2	16

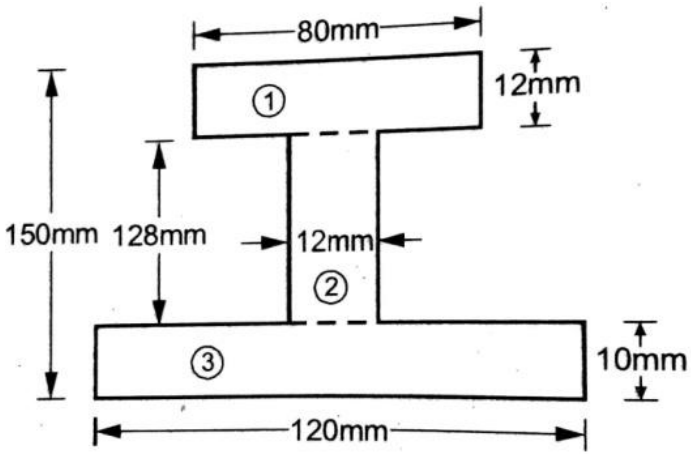


13.	a	Apply the methods of composite areas to find the centroid of the plane area shown in the figure; show the centroid coordinates measured from the given reference axes.	L3	3	16

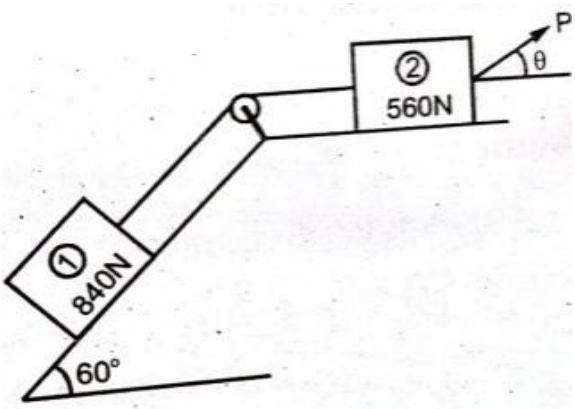


Or

	b	Develop the complete Moment-of-Inertia analysis for the given section: compute Ixx and Iyy about centroidal axes.	L3	3	16



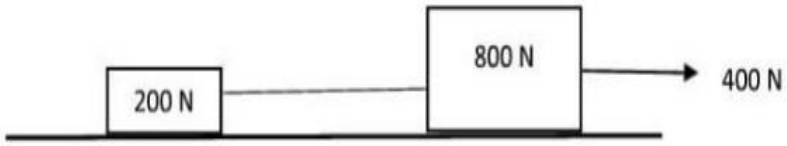
14.	a	Apply statics and friction-limit principles to find the least value of P required to prevent impending motion of the system (coefficient of friction = 0.2 at all contacts).	L3	4	16



Or

	b	A ladder 5 m long and 250 N weight is placed against a vertical wall in a position where its inclination to the vertical is 30◦. Identify the location (distance along the ladder from base or top) at which the 800 N man causes the ladder to slip, using μ = 0.2.	L3	4	16

15.	a	Analyze the system of two weights (800 N and 200 N) connected by a thread and moving on a horizontal plane under a 400 N force applied to the 800 N weight. Using D'Alembert's principle to determine: (a) the acceleration of the combined system and (b) the tension in the thread, given the coefficient of friction μ = 0.3.	L3	5	16



Or

	b	A projectile launched from a 150 m cliff at 180 m/s and 30° (no air resistance). Compute, (a) the horizontal distance from the gun to the landing point, and (b) the maximum elevation above ground achieved by the projectile.	L3	5	16