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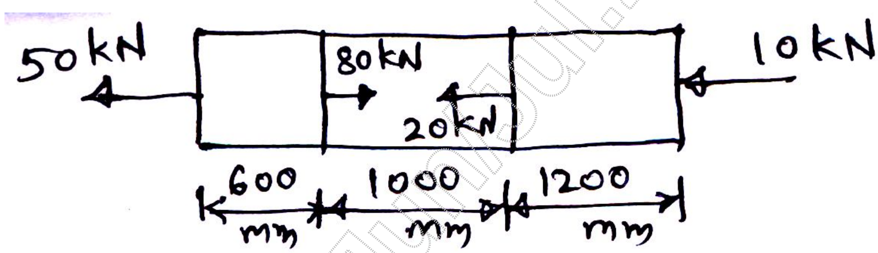
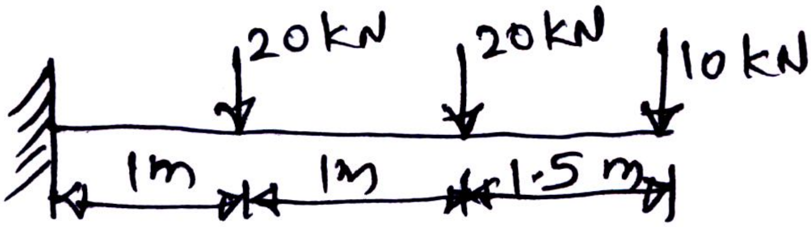
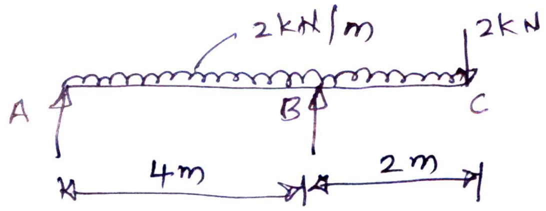
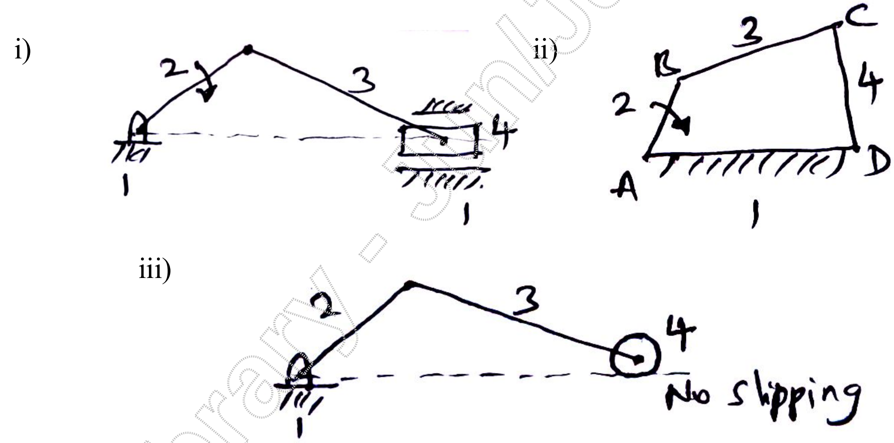
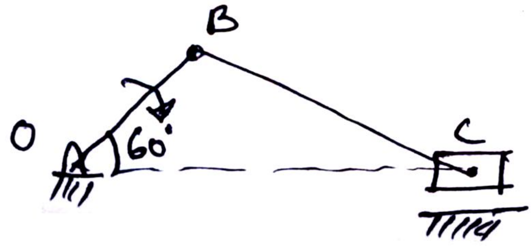
BAG304

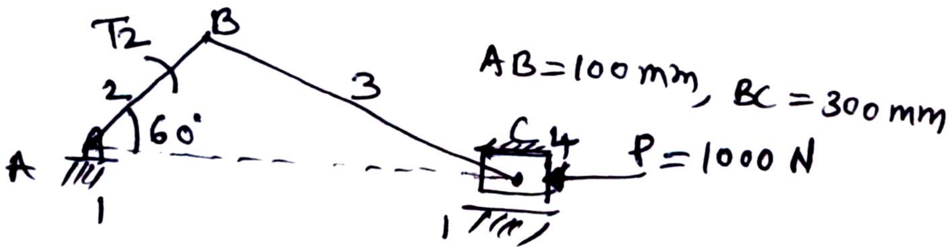
Third Semester B.E./B.Tech Degree Examination, June/July 2024
Mechanics of Materials and Machine

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.

		Module – 1	M	L	C
Q.1	a.	Derive an expression for the total deformation of a tapered bar of rectangular cross-section subjected to an axial load 'P'.	10	L2	CO1
	b.	A brass bar having cross sectional area of $1000mm^2$ is subjected to axial forces shown in Fig.Q1(b). Find the total elongation of the bar. Take $E = 100 \times 10^3 N/mm^2$.  Fig.Q1(b)	10	L2	CO1
		OR			
Q.2	a.	Derive the relationship between the modulus of elasticity (E) and modulus of rigidity (G).	10	L2	CO1
	b.	A bar of 20mm diameter is tested in tension. It is observed that when a load of 37.7kN is applied, the extension measured over a gauge length of 200mm is 0.12mm and contraction in diameter is 0.0036mm. Find the Poisson ratio and elastic constants E, G, K.	10	L3	CO1
		Module – 2			
Q.3	a.	Explain the different types of beams and loads on beams.	05	L1	CO1
	b.	Draw shear force diagram and bending moment diagram for the beam loaded as shown in Fig.Q3(b).  Fig.Q3(b)	15	L3	CO1

		OR			
Q.4		Draw shear force diagram and bending moment diagram for the beam loaded as shown in Fig.Q4. Locate the point of contra flexure if any.  Fig.Q4	**20**	**L3**	**CO1**
		Module – 3			
Q.5	**a.**	Define : i) Kinematic pair ii) Kinematic chain iii) Inversion iv) Mechanism v) Mass density.	**4**	**L1**	**CO1**
	b.	Determine the degrees of freedom for the following mechanism. (Refer Fig.Q5(b)(i),(ii),(iii).  Fig.Q5(b)(i),(ii),(iii)	**6**	**L2**	**CO2**
	c.	With a neat sketch explain the following inversions of mechanisms. i) Watt's straight line mechanism ii) Elliptical Trammels.	**10**	**L2**	**CO2**
		OR			
Q.6		In a slider crank mechanism, the crank OB = 30mm and the connecting rod BC = 120mm. The crank rotates at a uniform speed of 300rpm clockwise. For the crank position shown in Fig.Q6. Find : i) Velocity of piston 'C' and angular velocity of connecting rod BC ii) Acceleration of piston 'C' and angular reacceleration of connecting rod BC.  Fig.Q6	**20**	**L4**	**CO2**

		Module – 4			
Q.7	**a.**	A slider crank mechanism is shown in Fig.Q7(a). Calculate the driving torque T_2. The crank is at 60° from IDC. AB = 100mm, BC = 300mm.  Fig.Q7(a)	**15**	**L4**	**CO3**
	b.	Explain D'Alembert's principle.	**5**	**L3**	**CO3**
		OR			
Q.8	**a.**	With a neat sketch, explain gear terminology.	**10**	**L2**	**CO6**
	b.	With a neat sketche, explain simple, compound and epicyclic gear trains.	**10**	**L2**	**CO6**
		Module – 5			
Q.9	**a.**	What is machine design? Explain general procedure in machine design.	**10**	**L2**	**CO6**
	b.	Write the classifications of machine design.	**5**	**L2**	**CO6**
	c.	Explain the Newton's laws of motion.	**5**	**L2**	**CO6**
		OR			
Q.10	**a.**	Define : i) Mass and weight ii) Moment of force iii) Couple iv) Mass density.	**5**	**L2**	**CO6**
	b.	Explain the application of levers in engineering practice.	**5**	**L2**	**CO6**
	c.	With a neat sketch explain the types of springs.	**10**	**L2**	**CO6**

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