CBCS SCHEME

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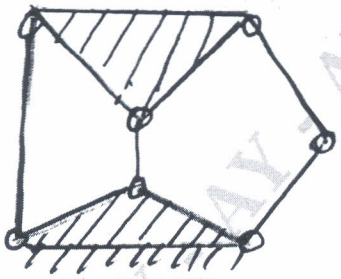
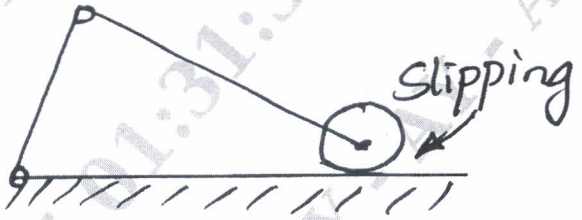
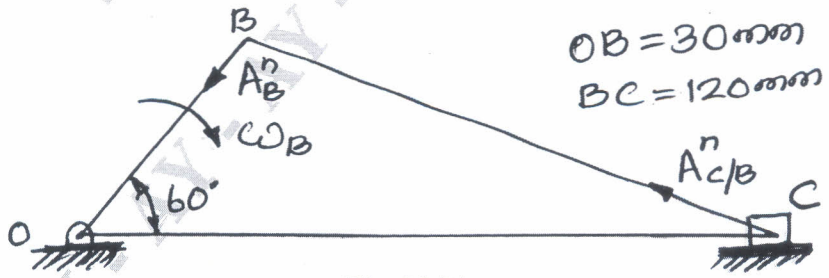
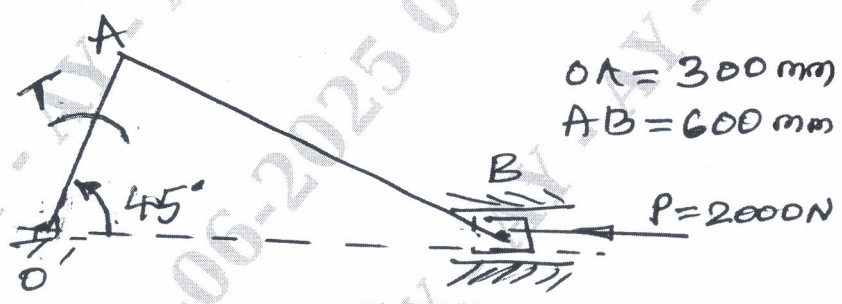
BAU401

Fourth Semester B.E/B.Tech. Degree Examination, June/July 2025
Theory of Machines

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
1	a.	Define : i) Kinematic chain ii) Higher pair iii) Lower pair iv) Degrees of freedom v) Kinematic link vi) Inversions.	6	L1	CO1
	b.	Compare : i) Machine and mechanism ii) Kinematic chain and structure.	6	L2	CO1
	c.	Analyse and evaluate the degress of for the following linkages shown in Fig.Q1(c)(i)(ii).  Fig.Q1(c)(i)  Fig.Q1(c)(ii)	8	L3	CO1
		OR			
2	a.	Explain the concepts of relative velocity and relative acceleration with respect to analysis of mechanisms.	6	L2	CO2
	b.	In a slider crank mechanism, the crank OB = 30 mm and the connecting rod BC = 120 mm. The crank rotates at a confirm speed of 300 rpm clockwise. For the crank positions shown in Fig.Q2(b). Determine the : i) Velocity of piston c and angular velocity of connecting rod BC ii) Acceleration of piston C and angular acceleration of connecting rod BC.  Fig.Q2(b)	14	L3	CO2

		Module – 2			
3	a.	State and prove law of gearing.	6	L1	CO3
	b.	Explain the interference in gears. Mentions the methods to avoid the interference.	6	L2	CO3
	c.	In a epicyclicgear train internal wheels A, B and compound wheels C and D rotate independently about axis D. The wheels E and F rotate on a pin fixed to arm G. The E gear mesh with gear A, C with gear B and F with gear D. All gears have same pitch with teeth on F 18, E 18, C is 28 and D is 26. Sketch the arrangement. Analyse and determine the speed of gear B, if arm G makes 160 rpm clock wise and wheel A makes 20 rpm counter clockwise.	8	L3	CO3
		OR			
4		Draw the profile of a cam operating a roller reciprocating follower with following data : Minimum radius of cam = 25 mm left = 30 mm, roller diameter = 15 mm. The cam lifts the follower 120° with SHM followed by a dwell period of 30°. Then the follower lowers down during 150° of the cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at uniform speed of 150 rpm, calculate the maximum velocity and acceleration of the flower during descent period.	20	L4	CO3
		Module – 3			
5	a.	Explain equilibrium of two, three forces member and two-force member with a torque.	8	L2	CO4
	b.	A slider crank mechanism shown in Fig.Q5(b). The force applied to the piston is 2000N when crank is at 45° from inner dead centre. Determine input torque T on link OA.  Fig.Q5(b)	12	L3	CO4
		OR			
6	a.	Explain D'Alemberts principle and its use.	5	L2	CO4
	b.	Explain briefly inertia forces on a four bar mechanism.	10	L2	CO4
	c.	List and explain important force acting on the reciprocating parts of an engine.	5	L1	CO4
		Module – 4			
7	a.	Derive the equation for size of fly wheel or hoop stress developed in a flywheel.	10	L1	CO
	b.	Sketch and explain TMD (Turning Moment Diagram) for single cylinder double acting steam engine and for 4 stroke IC engine.	10	L2	CO4

		OR			
8	a.	Classify the governors and explain a porter governor with a neat sketch.	**5**	**L2**	**CO4**
	b.	Explain effort, power and controlling force of a governor.	**5**	**L2**	**CO4**
	c.	In an engine governor of the porter type, the upper and lower arms are 200 mm and 250 mm respectively and pivoted on the axis of rotation. The mass of the central load is 15 kg, the mass of each ball is 2 kg and friction of the sleeve together with the resistance of the operating frictional force in the gear is equal to a load of 25 N at the sleeve. If the limiting inclinations of the upper arms to the vertical are 30° and 40°. Determine the range of the governor taking frictional load into account.	**10**	**L3**	**CO4**
		Module – 5			
9	a.	Derive an expression for total frictional torque of a flat collar bearing considering uniform pressure	**8**	**L3**	**CO4**
	b.	Explain the law of friction and list the types of friction.	**4**	**L2**	**CO4**
	c.	In a thrust bearing, the external and internal diameter of the contact surfaces are 300 mm and 200 mm respectively. The total axial load is 160 KN and the intensity of pressure is 250 KN/m^2. The speed of the shaft is 500 rpm and coefficient of friction is 0.05. determine : i) Number of collars required ii) Power lost due to friction.	**8**	**L3**	**CO4**
		OR			
10	a.	Derive an expression for length of open belt drive.	**8**	**L3**	**CO4**
	b.	Two pulleys of diameter 0.5 m and 0.2 m are connected by an open belt drive. The pulleys are 1 meter apart. The speed of the smaller pulley is 400 rpm. The coefficient of friction between belt and the larger pulley surface is 0.35 and the maximum tension in the belt is 2 KN. Determine : i) Coefficient of friction between the belt and the smaller pulley surface so that slipping is about to take place at both pulleys at the same time ii) Power transmitted iii) Length of the belt required.	**12**	**L3**	**CO4**

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