U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June / July 2025 Semester End Main Examinations

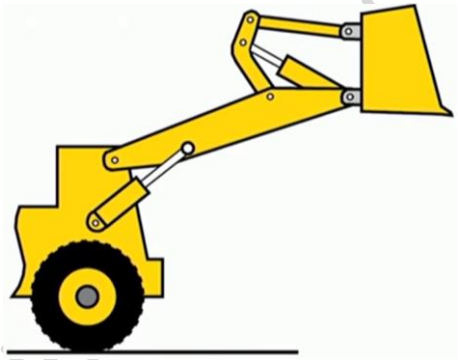
Programme: B.E. **Semester: III**

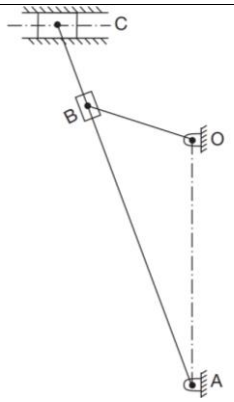
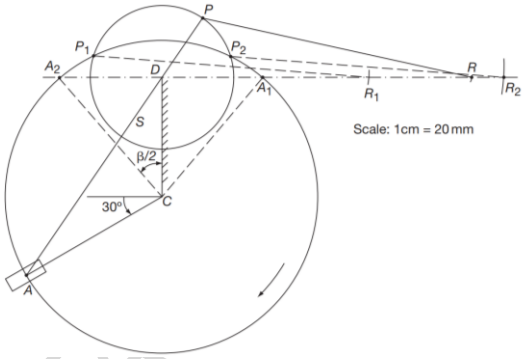
Branch: AEROSPACE ENGINEERING **Duration: 3 hrs.**

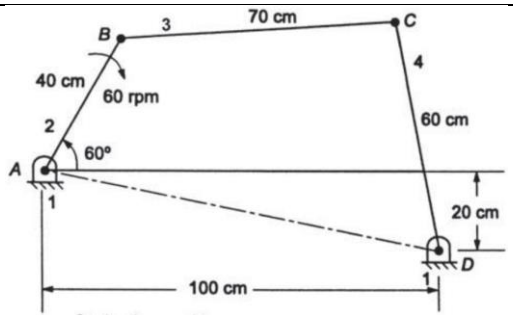
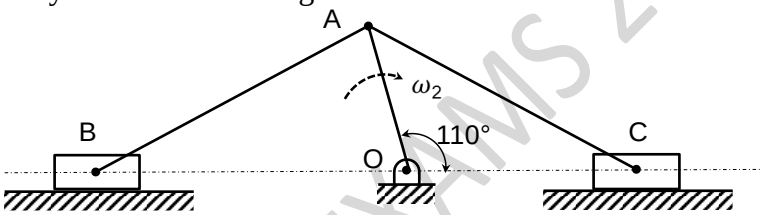
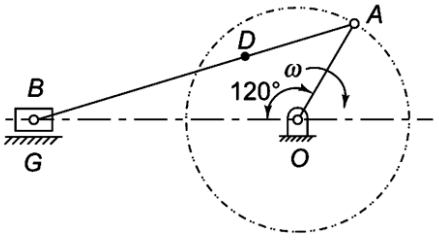
Course Code: 23AS3ESTOM / 22AS3ESTOM **Max Marks: 100**

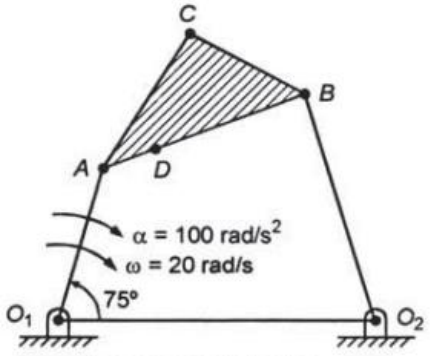
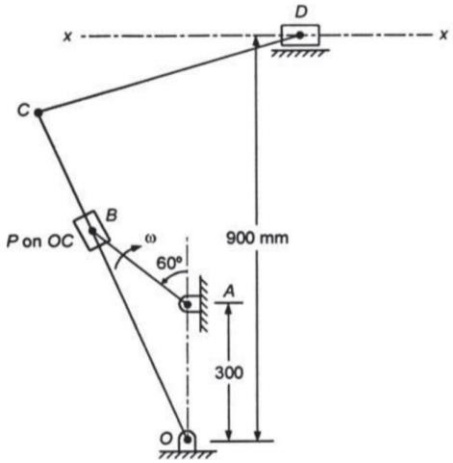
Course: THEORY OF MECHANISMS

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

		UNIT - I	CO	PO	Marks
1	a)	Explain with neat sketch the various types of Links and Joints	CO 1	PO1	**10**
	b)	Draw a kinematic diagram and determine the mobility for the mechanism shown below in Figure 1.b.  Fig.1b	CO 1	PO2	**10**
		OR			
2	a)	Explain the Grashof Condition with sketches.	CO 1	PO1	**10**
	b)	Five binary links of length 5 cm, 8cm, 15 cm, 19 cm and 28 cm are available for constructing a crank-rocker mechanism. Select four links required for the construction of this mechanism. Draw a rough sketch of the mechanism and clearly show the fixed link, crank, and rocker.	CO 1	PO2	**10**
		UNIT - II			
3	a)	Describe with neat sketches the inversions of the quadratic chain.	CO2	PO1	**12**
	b)	Design a quick return mechanism of the type shown in below Figure 3b The working stroke is 200 mm and the ratio of the time of working stroke to return stroke is 2:1. The driving crank is 50 mm long.	CO2	PO2	**08**

			 Fig.3b			
			OR			
	4	a)	Describe with neat sketches of inversions of the double slider crank chain.	*CO2*	*PO1*	**12**
		b)	In a Whitworth quick return motion mechanism, as shown in Figure 4b the distance between the fixed centers is 60 mm and the length of the driving crank is 80 mm. The length of the slotted lever is 160 mm and length of the connecting nod is 140 mm. Find the ratio of the time of cutting stroke to the time of return stroke and also the effective stroke.  Fig.4b	*CO2*	*PO2*	**08**
			UNIT - III			
	5	a)	With neat sketches explain the position of instantaneous centers for the pins, rolling, and sliding bodies.	*CO3*	*PO1*	**08**
		b)	The crank AB of a four-bar mechanism shown in Figure 5b rotates at 60 rpm clockwise. Determine the relative angular velocities of the coupler to the crank and the lever to the coupler. Find also the rubbing velocities at the surface of pins 25 mm radius at the joints B and C.	*CO3*	*PO2*	**12**

			 Fig.5b			
			OR			
6	a)		Write the Instantaneous Center procedure for computing velocity of output link in a quadratic chain with Input link is cranking with uniform speed.	*CO4*	*PO1*	**08**
	b)		A double slider crank mechanism is shown in Figure 6b. The crank OA rotates at a constant angular velocity of 10 rad/s clockwise. The links OA, AB, and AC are 100 mm, 200 mm and 200 mm long respectively, and angle AOC =110°. By drawing the velocity polygon, determine the velocity of each slider and the angular velocity of each connecting rod.  Fig.6b	*CO4*	*PO2*	**12**
			UNIT - IV			
7	a)		Explain with a neat sketch the velocity and acceleration curves of a vehicle that starts from rest, attains a top speed, and then stops	*CO4*	*PO1*	**06**
	b)		Figure 7b shows the configuration of an engine mechanism. The dimensions are the following. Crank OA = 200mm, Connecting rod AB =600mm, a distance of center of mall from crank end AD = 200mm. At the instant, the crank has an angular velocity of 50 rad/s clockwise and an angular acceleration of 800 rad/s^2. Calculate the (i) velocity of D and angular velocity of AB (ii) acceleration of D and angular acceleration of AB, (iii) Point on the connecting rod which has zero acceleration at this instant.  Fig.7b	*CO4*	*PO2*	**14**
			OR			

	8	a)	Derive and explain the radial and tangential acceleration of a link.	*CO4*	*PO1*	**6**
		b)	A four-bar mechanism with the ternary link is shown in Figure 8b. The lengths of various links are given as below: O1O2 = 600 mm, O1A = 300 mm, AB = 400 mm, O2B = 450 mm, AC = 300 mm, BC = 250 mm, AD =100 mm, and angle AO1O2 is 75 degrees. Angular velocity of crank O1A = 20 rad/s, Angular acceleration of crank O1A = 100 rad/s2 Determine (i) acceleration of coupler AB, (ii) acceleration of lever O2B, (iii) acceleration of points C and D, and (iv) angular acceleration of ternary link.  Fig.8b	*CO4*	*PO2*	**14**
			UNIT - V			
	9		Derive the expression for the Coriolis acceleration for radial and tangential accelerations of a moving point relative to a fixed body the cases (without and with considering the angular acceleration).	*CO4*	*PO1*	**20**
			OR			
	10		In the crank and slotted lever type quick return motion mechanism shown in Figure 10a, the crank AB rotates at 120 rpm. Determine (i) velocity of ram at D, (ii) magnitude of Coriolis acceleration component, and (iii) acceleration of ram at D. AB = 200 mm, OC =800 mm, CD =600 mm and OA =300 mm.  Fig.10a	*CO4*	*PO2*	**20**

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