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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: IV**

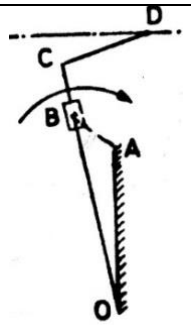
Branch: Mechanical Engineering **Duration: 3 hrs.**

Course Code: 19ME4DCKOM **Max Marks: 100**

Course: Kinematics of Machines

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

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Differentiate between a machine and a mechanism.	*CO1*	*PO1*	**06**
	b)		With the help of neat sketches, explain all three inversions of four-bar mechanism.	*CO1*	*PO1*	**14**
			OR			
2	a)		With the help of a neat sketch, explain the crank and slotted lever type of quick return motion mechanism.	*CO1*	*PO1*	**10**
	b)		With the help of a neat sketch, explain the Geneva wheel intermittent motion mechanism.	*CO1*	*PO1*	**10**
			UNIT - II			
3	a)		With the help of a neat sketch, derive an expression for Coriolis acceleration.	*CO1*	*PO1*	**05**
	b)		The crank AB of a four-bar mechanism ABCD revolves uniformly at 2 rps in a clockwise direction. Find angular acceleration of links BC and CD and acceleration of point E on link BC. Given AB = 75 mm, BC = 175 mm, EC = 50 mm, CD=150 mm, DA = 100 mm and angle BAD = 90°.	*CO1*	*PO2*	**15**
			OR			
4			The following data refer to a quick return motion mechanism of crank and slotted lever type as shown in Fig. (1). The dimensions are; Fixed link OA=250 mm, Crank AB= 100 mm, Slotted lever OC=400 mm, CD=150 mm and Angle OAB=120°. Uniform speed of crank in clockwise direction is 1 rps. The vertical distance of line of stroke of ram at D from O is 45 cm. Determine acceleration of ram at D and coriolis acceleration of slider at B.  Fig. (1)	*CO1*	*PO1* *PO2*	**20**

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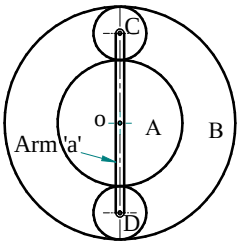
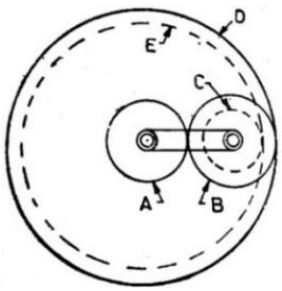
			UNIT - III			
	5	a)	The crank of a reciprocating engine revolves at uniform speed of 310 rpm in clockwise direction. The crank and connecting rod are 150 mm and 650 mm long respectively. Using instantaneous centre method, find the velocity of piston when the crank has turned through 30° from inner dead centre.	*CO1*	*PO1* *PO2*	**10**
		b)	How do you determine acceleration of midpoint 'X' of connecting rod of slider crank mechanism by Klein's construction?	*CO1*	*PO1* *PO2*	**10**
			OR			
	6	a)	With a neat sketch, give the Gear terminology.	*CO2*	*PO1* *PO2*	**08**
		b)	With a neat sketch, derive conditions for correct gearing.	*CO2*	*PO1* *PO2*	**12**
			UNIT - IV			
	7	a)	With neat sketches, give the classification of gear trains.	*CO2*	*PO1* *PO2*	**08**
		b)	Fig (2) shows an epicyclic gear train. Number of teeth on A and B are 80 and 200. Determine the speed of the arm 'a' (i) if A rotates at 100 rpm clockwise and B at 50 rpm counter-clockwise. (ii) if A rotates at 100 rpm clockwise and B is stationary.  Fig. (2)	*CO2*	*PO1* *PO2*	**12**
			OR			
	8	a)	Fig. (3) shows epicyclic gear train arrangement in which pinion A has 20 teeth and is rigidly fixed to the motor shaft. The wheel B has 25 teeth and gears with A and also with annular fixed wheel D. Pinion C has 20 teeth and is integral with B (C and B being a compound gear wheel). Gear C meshes with annular wheel E which is keyed to the machine shaft. The arm rotates about the same shaft on which A is fixed and carries the compound wheels B and C. If the motor runs at 1000 rpm, find the speed of machine shaft.  Fig. (3)	*CO2*	*PO1* *PO2*	**12**
		b)	Propose a gear train arrangement for a watch mechanism where hour and minute needles are to be mounted on the same axis. Explain the same with a neat sketch.	*CO2*	*PO1* *PO2*	**08**

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			UNIT - V			
	9	a)	Give the classification of cams with sketches.	*CO3*	*PO1* *PO2*	**08**
		b)	Draw the profile of a cam operating a knife edged follower from the following data: It lifts the follower through 37.5 mm during its 60° rotation with SHM. The follower remains at rest for the next 40° rotation of the cam. The follower then descends to its original position during the next 90° rotation of cam with SHM. The follower remains at rest for the rest of the rotation of cam. The least radius of cam is 50 mm.	*CO3*	*PO1* *PO2*	**12**
			OR			
	10		Draw the profile of a cam operating a roller follower of 25 mm diameter from the following data: It lifts the follower through 37.5 mm during its 60° rotation with SHM. The follower remains at rest for the next 40° rotation of the cam. The follower then descends to its original position during the next 90° rotation of cam with SHM. The follower remains at rest for the rest of the rotation of cam. The least radius of cam is 50 mm.	*CO3*	*PO1* *PO2*	**20**

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