

Code: 20ME3401

**II B.Tech - II Semester – Regular / Supplementary Examinations
MAY - 2023**

**KINEMATICS OF MACHINERY
(MECHANICAL ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.

2. All parts of Question must be answered in one place.

BL – Blooms Level

CO – Course Outcome

			BL	CO	Max. Marks
UNIT-I					
1	a)	Explain machine and mechanism with a flow diagram.	L2	CO1	7 M
	b)	The length of the fixed link in a crank and slotted lever quick return mechanism is 300 mm and crank is 110 mm. Determine the inclination of the slotted lever with the vertical in the extreme position.	L2	CO1	7 M
OR					
2	a)	Explain different types of constrained motions with examples.	L2	CO1	7 M
	b)	In a Whitworth quick return motion mechanism, the distance between the fixed centers is 50 mm and the length of the driving crank is 75 mm. The length of the slotted lever is 150 mm and the length of the connecting rod is 135 mm. Find the ratio of time of cutting and return strokes and also the effective stroke.	L4	CO1	7 M

UNIT-II					
3	a)	Derive Arnold Kennedy's theorem and apply to slider crank mechanism.	L4	CO2	7 M
	b)	Locate all the Instantaneous centers of slider crank mechanism with crank length of 25mm rotating clockwise at a uniform speed of 100 rpm. The crank makes 45° with IDC and the connecting rod is 400 mm long. Determine the velocity of the slider and the angular velocity of connecting rod.	L4	CO2	7 M
OR					
4	a)	Derive the velocity of piston using I-center method.	L2	CO2	7 M
	b)	In a four link mechanism, the dimensions of the links are AB=200 mm, BC=400mm, CD=450 mm and AD=600mm. At the instant when $\angle DAB = 90^{\circ}$, the link AB has angular velocity of 36 rad/s in the clockwise direction. Determine (i) The velocity of point C, (ii) The velocity of point E on the link BC When BE =200 mm (iii) The angular velocities of links BC and CD, (iv) Acceleration of link BC.	L4	CO2	7 M
UNIT-III					
5	a)	Describe any one mechanism having all turning pairs that generate an exact straight line.	L2	CO3	7 M
	b)	Derive the condition for generating a straight line in Grasshopper's mechanism.	L2	CO3	7 M
OR					

6	a)	Derive an expression for the ratio of shaft velocities in a Hooke's joint.	L2	CO3	7 M
	b)	In a Davi's steering gear, the distance between the pivots of the front axle is 1 meter and the wheel base is 2.5 meters. Find the inclination of the track arm to the longitudinal axis of the car when it is moving along a straight path?	L4	CO3	7 M

UNIT-IV

7	a)	Draw and explain the displacement and velocity diagrams for uniform velocity motion.	L2	CO4	7 M
	b)	Draw a cam to raise a valve through a distance of 50 mm in 1/3 of revolution with SHM, keep it fully raised through 1/12 of revolution and lower it with harmonic motion in 1/6 of revolution. The valve remains closed during the rest of the revolution. The diameter of the roller is 20 mm and the minimum radius of the cam is 25 mm. The axis of the valve rod passes through the axis of the cam shaft.	L4	CO4	7 M

OR

8	a)	Define angle of action, angle of dwell and pressure angle in a cam with diagrammatic representation.	L2	CO4	7 M
	b)	A cam, with a minimum radius of 50mm, rotating clockwise at a uniform speed, is required to give a knife edge follower the motion as described. (i) to move outwards through 40mm during 100° of rotation of the cam. (ii) to dwell for the next 80° (iii) to return to its starting position during the next	L4	CO4	7 M

		<p>90° (iv) to dwell for the rest period of revolution.</p> <p>Draw the profile of the cam when the line of the stroke of the follower passes through the center of the cam shaft when the displacement of the follower is to take place with uniform acceleration and uniform retardation. Determine the maximum velocity and acceleration when the cam shaft rotates at 900 r.p.m.</p>			
UNIT-V					
9	a)	Derive an expression for the length of path of contact.	L2	CO5	7 M
	b)	A pair of gears having 40 and 20 teeth respectively is rotating in mesh. The speed of the smaller is 2000 rpm. Determine the velocity of sliding at the point of engagement, at the pitch point and at the point of disengagement. Assume that the gear teeth are 200 involute, addendum is 5 mm and module is 5 mm.	L4	CO5	7 M
OR					
10	a)	Explain with a neat sketch the sun and planet wheel.	L2	CO5	7 M
	b)	In a reverted epicyclic train, the arm F carries two wheels A and D and a compound wheel B-C. Wheel A meshes with wheel B and Wheel D meshes with wheel C. The number of teeth on wheel A, D and C is 80, 48, and 72. Find the speed and direction of wheel D, when wheel A is fixed and arm F makes 200 rpm clockwise.	L4	CO5	7 M