Code No.: ME402PC | R20 | H.T.No. | | | 8 | R | | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–II–Semester End Examinations (Regular) - August- 2023
KINEMATICS OF MACHINERY
(MECH)

[Time: 3 Hours] **[Max. Marks: 70]**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A **(20 Marks)**

1. a) What is the difference between Mechanism, Machine and Structure? [2M]
   b) Write the inversions of double slider crank mechanism. [2M]
   c) What are the different types of instantaneous centers? [2M]
   d) Define the term 'Relative velocity'. [2M]
   e) What are the limitations of a single Hooke's joint? [2M]
   f) What is pantograph? How it differs from straight line motion mechanism? [2M]
   g) What are cams with specified contours? Why are they necessary? [2M]
   h) What is the difference between radial cams and cylindrical cams? [2M]
   i) Define Law of Gearing and Pressure angle. [2M]
   j) What is reverted gear train? Where it is used? [2M]

PART-B **(50 Marks)**

2. Explain complete, incomplete and successful constraints of relative motion mechanisms. [10M]

OR

3. The length of fixed link of a crank and slotted lever mechanism is 275 mm and that of the crank 110 mm. Determine, [10M]
   i. The inclination of the slotted lever with the vertical in the extreme position.
   ii. The ratio of the time of cutting stroke to the time of return stroke and
   iii. The length of the stroke, if the length of the slotted lever is 495 mm and the line of stroke passes through the extreme positions of the free end of the lever.

4. If 'P' is a point on a link OR which is rotating about the fixed point 'O' with an angular velocity of ω, and P is sliding inwards towards 'O' on the link OR with a linear velocity v, derive the expression for Coriolis component of acceleration when [10M]
   i. both ω and v are constant,
   ii. both ω and v vary with time.

OR

5. In a pin-jointed four bar mechanics ABCD link AD is fixed and crank AB rotates at 12 rad/sec clockwise. AB = 60 mm; BC = CD = 70 mm; DA = 120 mm when the angle DAB = 60^0 and both B and C lie on the same side of AD, find a) angular velocities of BC and CD and b) angular accelerations. [10M]

6. Draw a neat sketch of the Peaucellier straight line motion mechanism, and prove that it produces an exact straight-line motion. [10M]

OR

7. What are the conditions for correct steering and explain with a sketch the working of Ackerman's steering gear. [10M]

8. Draw the profile of a cam operating a roller reciprocating follower having a lift of 30 mm. The line of stroke of the follower passes through the axis of the cam shaft the radius of the roller is 12 mm and minimum radius of cam is 45 mm. The cam rotates at 600 rpm counter clockwise the follower is raised with SHM for 90^0 of cam rotation dwell for next 80^0 and lowers with uniform acceleration and deceleration for the next 120^0. The follower dwells for the rest of cam rotation. [10M]

OR

9. For a Tangent cam operating a reciprocating roller follower, derive the expressions for Displacement, Velocity, and acceleration of the Follower when the Follower is in contact with the cam [10M]
   i. between the Roller and Straight flank, and
   ii. between the Roller and Nose. Also find the maximum and minimum Velocities and Accelerations of the Follower in both the above cases.

10. Derive an expression for the minimum number of teeth required on the pinion in order to avoid interference in involute gear teeth when it meshes with wheel. [10M]

OR

11. An epicyclic gear consist of a pinion, a wheel of 40 teeth and an annulus with 84 internal teeth concentric with the wheel. The pinion gears with the wheel and the annulus. The arm that carries the axis of the pinion rotates at 100 rpm. If the annulus is fixed, find the speed of the wheel, and if wheel is fixed, find the speed of the annulus. [10M]

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