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

# CMR ENGINEERING COLLEGE: : HYDERABAD
## UGC AUTONOMOUS
## II–B.TECH–II–Semester End Examinations (Regular) - June- 2022
## KINEMATICS OF MACHINERY
## (MECH)

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

**Note:** 1. *Answer any FIVE questions. Each question carries 14 marks.*
2. *All questions carry equal marks.*
3. *Illustrate your answers with NEAT sketches wherever necessary.*

**5X14=70**

1. a) What is the degree of freedom of a mechanism? How is it determined? [7M]
   b) Describe all the possible inversions of double slider crank chain mechanism. Give at least one practical application for each inversion. [7M]

2. a) Define instantaneous center of rotation. State and prove Kennedy's theorem as applicable to instantaneous centers of rotation of three bodies. [7M]
   b) In a slider crank mechanism, the lengths of the crank and the connecting rod are 200 mm and 800 mm respectively. When the crank has turned $45^0$ from its inner dead center and it rotates at 40 rad/sec, Determine the velocity of slider. [7M]

3. a) Differentiate approximate and exact straight line motion mechanism. [7M]
   b) What is an automobile steering gear? What are its types? Which steering gearing is preferred and why? [7M]

4. a) Deduce the expressions for the velocity and acceleration of the follower when it moves with simple harmonic motion. [7M]
   b) Draw the profile of a cam operating a knife-edge follower having a lift of 30 mm the cam raises the follower with SHM for $150^0$ of the rotation followed by a period of dwell for $60^0$. The follower descends for the next $100^0$ rotation of the cam with uniform velocity again followed by a dwell period. The cam rotates at uniform velocity of 120 rpm and has a least radius of 20 mm. [7M]

5. a) Two mating spur gears have 24 and 30 teeth, a standard addendum of one module,and a pressure angle of $20^0$. Find the length of the arc of contact in terms of the circular pitch. [7M]
   b) An epicyclic gear train as shown in figure1 Two planet gears B and C having 30 teeth each are attached to the arm E and Gear A is having 40 teeth instead of 50, then find the number of revolutions made by the arm when: [7M]
      i) gear A makes one revolution Clockwise and D makes half a revolution anticlockwise and
      ii) gear A makes one revolution clockwise and D is stationary

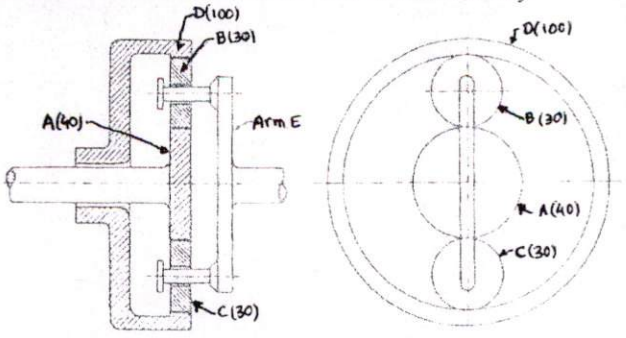


Figure 1

6. a) Define kinematic pair. Explain different kinematic pairs with examples. [7M]
   b) In a *Crank-and-Slotted lever Quick-Return motion mechanism*, derive an expression for the ratio of the time of cutting stroke to the time of cutting stroke. [7M]

7. a) Draw and explain the KLEIN's construction for the velocity diagram of a Reciprocating Engine Mechanism? With this construction, how do you find the velocities of the piston and connecting rod in terms of the uniform angular velocity of the crank? [7M]
   b) For the configuration of a slider-crank mechanism shown in the figure 1, calculate the: [7M]
      i. Velocity of the slider B
      ii. Velocity of the point E

   Angular velocity of the link AB, OA rotates at 20rad/s CCW.

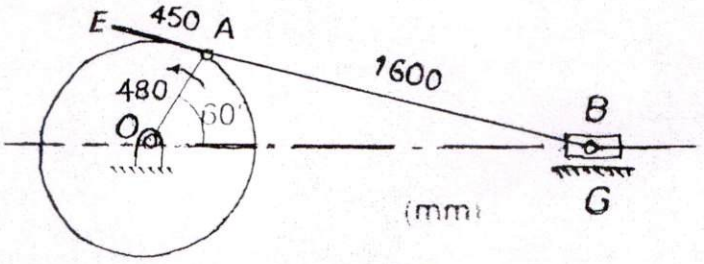


Figure 1

8. a) Sketch and describe the principle of Robert mechanism. [7M]
   b) Derive expression for Davis steering gear mechanism. [7M]

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