

Code: 20ME3401

II B.Tech - II Semester – Regular Examinations – JULY 2022**KINEMATICS OF MACHINERY
(MECHANICAL ENGINEERING)**

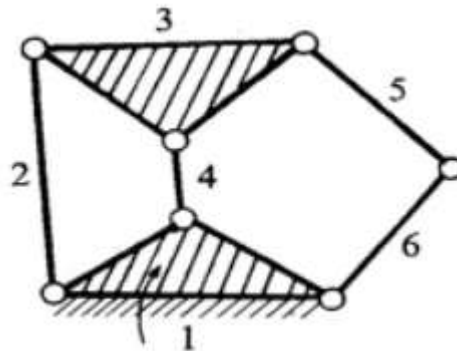
Duration: 3 hours

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.

UNIT – I

1. a) What is the difference between a mechanism and a structure? 2 M
- b) Determine the degree of freedom of the following.



4 M

- c) Sketch and explain any two inversions of a double slider crank chain? 8 M

OR

2. a) Discuss various types of constrained motion. 7 M
- b) Describe the inversions of single slider crank chain when (i) Sliding pair is fixed, (ii) crank is fixed 7 M

UNIT – II

3. In a four bar mechanism ABCD, link AD is fixed and the crank AB rotates at 10 rad/s clockwise. Lengths of the links are $AB = 60$ mm; $BC = CD = 70$ mm; $DA = 120$ mm. When angle $DAB = 60^\circ$ and both B and C lie on the same side of AD, find angular velocities and angular acceleration of BC and CD. 14 M

OR

4. a) Derive the expression to determine the magnitude of the coriolis component of acceleration. 7 M
- b) State and prove Kennedy's theorem of instantaneous centers of rotation of three bodies. 7 M

UNIT-III

5. a) Show that a point in the Hart Mechanism moves exactly along a straight path. 7 M
- b) Derive an expression for the ratio of angular velocities of the shafts of a Hooke's joint. 7 M

OR

6. a) What is Scott Russell's mechanism? How it can be modified to produce Grasshopper mechanism? 7 M
- b) What is the condition for correct steering? Sketch and explain Davis Steering gear mechanism. 7 M

UNIT – IV

7. A cam is to give the following motion to a knife-edged follower :
1. Outstroke during 60° of cam rotation;
 2. Dwell for the next 30° of cam rotation;
 3. Return stroke during next 60°

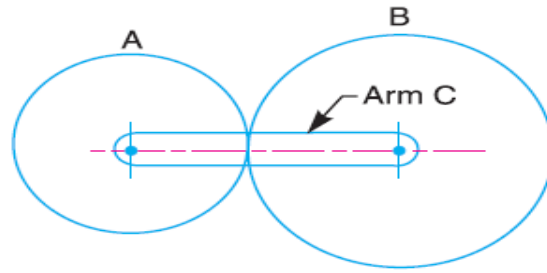
of cam rotation; and 4. Dwell for the remaining 210° of cam rotation. The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft. 14 M

OR

8. A cam rotating clockwise at a uniform speed of 200 r.p.m. is required to move an offset roller follower with a uniform and equal acceleration and retardation on both the outward and return strokes. The angle of ascent, the angle of dwell and the angle of descent are 120° , 60° and 90° respectively. The follower dwells for the rest of cam rotation. The least radius of the cam is 50 mm, the lift of the follower is 25 mm and the diameter of the roller is 10mm. The line of stroke of the follower is offset by 20 mm from the axis of the cam. Draw the cam profile and find the maximum velocity and acceleration of the follower during the outstroke. 14 M

UNIT – V

9. In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 300 r.p.m. in the clockwise direction, what will be the speed of gear B ?



14 M

OR

10. a) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10mm addendum. Find the length of path of contact, arc of contact and the contact ratio.

7 M

- b) Two parallel shafts are to be connected by spur gearing. The approximate distance between the shafts is 600 mm. If one shaft runs at 120 r.p.m. and the other at 360 r.p.m., find the number of teeth on each wheel, if the module is 8 mm. Also determine the exact distance apart of the shafts.

7 M