

CBCS SCHEME

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18ME44

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Kinematics of Machines

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is quick return motion? Explain with neat sketch crank and slotted lever mechanism. (10 Marks)
- b. Draw a neat sketch of Peaucellier's mechanism. Explain with proof how the tracing point describes a straight line path. (10 Marks)

OR

- 2 a. Define the following:
 - i) Link
 - ii) Kinematic chain
 - iii) Degree of freedom
 - iv) Inversion. (08 Marks)
- b. Explain with a neat sketch:
 - i) Beam engine mechanism
 - ii) Geneva wheel mechanism
 - iii) Toggle mechanism. (12 Marks)

Module-2

- 3 For a four bar mechanism shown in Fig.Q.3 determine the acceleration of C and angular acceleration of link 3 when crank 2 rotates at 20 radians per second. (20 Marks)

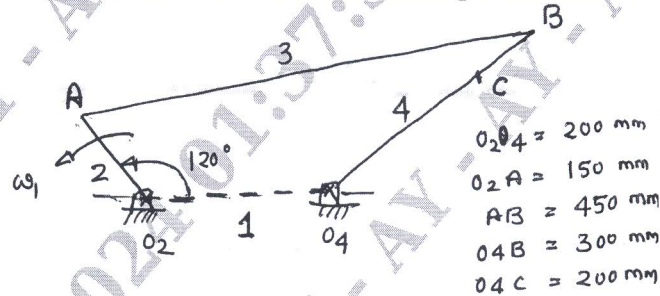


Fig.Q.3

OR

- 4 a. Define velocity of rubbing and spherical motion. (04 Marks)
- b. State and prove Kennedy's theorem. (06 Marks)
- c. In a slider crank mechanism shown in Fig.Q.4(c) the crank OA = 300mm and connecting rod AB = 1200mm. The crank OA is turned 30° from inner dead centre. Locate all the instantaneous centres. If the crank rotates at 15rad/sec clockwise find i) Velocity of slider B ii) Angular velocity of connecting rod AB. (10 Marks)

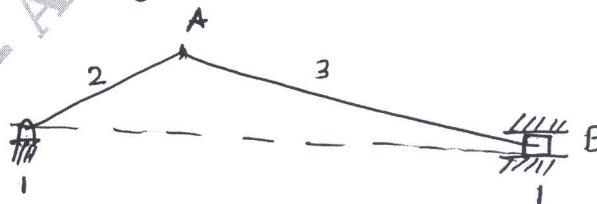


Fig.Q.4(c)
1 of 2

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-3

- 5 The crank of an engine is 200mm long and the ratio of connecting rod length to crank radius is 4. Determine the acceleration of piston when the crank has turned through 45° from the inner dead centre position and moving towards centre at 240rpm (CCW) direction by complex Algebra analysis. (20 Marks)

OR

- 6 a. Derive the expression for Freudenstein's equation for four bar mechanism. (15 Marks)
b. Explain function generation for four bar mechanism. (05 Marks)

Module-4

- 7 Draw the cam profile for cam with roller reciprocating follower. The axis of follower passes through the axis of cam. Particulars of cam and follower are the following:
Roller diameter = 20mm
Minimum radius of cam = 25mm
Total lift = 30mm
The cam has to lift the follower with SHM during 180° of cam rotation. Then allow the follower to drop suddenly half way and further return with uniform velocity during the remaining 180° of cam rotation. The cam rotates in anticlockwise direction. (20 Marks)

OR

- 8 A vertical spindle supplied with a plane horizontal face at its lower end is actuated by a cam keyed to a uniformly rotating shaft. The spindle is raised through a distance of 30mm in one fourth, remains at rest in $1/4$ is lowered in $1/3$ and remains at rest for the remainder of a complete revolution. Draw the profile assuming the least radius of cam profile as 25mm and that the spindle moves with uniform acceleration and retardation on both during ascent and descent. However during descent deceleration period is half the acceleration period. The axis of spindle passes through cam axis the cam rotates in anticlockwise direction. (20 Marks)

Module-5

- 9 a. Explain interference in gears. Discuss the methods of avoiding interference in gear drives. (10 Marks)
b. A pair of gears 40 and 30 teeth respectively are of 25° involute form addendum = 5mm module = 2.5mm if the smaller wheel is the driver and rotates at 1500rpm find the velocity of sliding at the point of engagement, at pitch point and the point of dis engagement, length of path of contact and length of arc of contact. (10 Marks)

OR

- 10 a. What do you mean by epicyclic gear train and also find the train value by algebraic method. (04 Marks)
b. In an epicyclic gear train the internal wheels A, B and the compound wheel C and D rotate independently about the axis "O". The wheels E and F rotate on a pin fixed to the arm G. E gears with A and C and F gears with B and D. All the wheels have same pitch and the number of teeth on E and F are 18, C = 28, D = 26.
i) Sketch the arrangement ii) Number of teeth on A and B iii) If arm G makes 150rpm CW and A is fixed find speed of B iv) If arm G makes 150rpm CW and wheel A makes 15rpm CCW find speed of B. (16 Marks)
