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CMR ENGINEERING COLLEGE: : HYDERABAD

UGC AUTONOMOUS

II-B.TECH-II-Semester End Examinations (Supply) - February- 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) Define kinematic chain. List out types of kinematic chain. [2M]
- b) Distinguish between Rigid link, Flexible link and Fluid link. [2M]
- c) Define instantaneous centre of rotation. [2M]
- d) Draw the acceleration diagram of a slider crank mechanism. [2M]
- e) Write the main advantage and the main limitation of the Hart mechanism over the Peaucellier mechanism. [2M]
- f) What is the condition of correct steering? [2M]
- g) List out the types of cams. [2M]
- h) Differentiate between Cam angle and pressure angle. [2M]
- i) Write down the differences between involute and cycloidal tooth profile. [2M]
- j) Write the condition to avoid minimum number of teeth to avoid interference between gears. [2M]

PART-B

(50 Marks)

- 2.a) Explain the classification of kinematic pairs with the help of examples. [5M]
 - b) Explain the inversions of double slider crank mechanism. [5M]
- OR**
- 3.a) Explain different types of links with examples. [5M]
 - b) Illustrate different types of constrained motion with sketches. [5M]

4. A link AB of a four bar linkage ABCD revolves uniformly at 120 rpm in a clockwise direction. Find the angular acceleration of links BC and CD and acceleration of point E in link BC. Given : AB = 7.5 cm, BC = 17.5 cm, EC = 5 cm, CD = 15 cm; DA = 10 cm and angle BAD = 90°. [10M]

OR

5. The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 r.p.m. The crank is 150 mm, the crank angle is 45° and the connecting rod is 600 mm long. Determine linear velocity and acceleration of the midpoint of the connecting rod. [10M]

- 6.a) Describe the working of Ackerman steering gear mechanism with neat sketch. [5M]
 b) The shafts with an inclination of 160° are connected by Hooke's joint. The driving shaft runs at a uniform speed of 1500 rpm. The driven shaft carries a flywheel of mass 12kg and 100mm radius of gyration. Find the maximum angular acceleration of driven shaft and maximum torque. [5M]

OR

- 7.a) With a neat sketch, explain the working of Scott – Russell mechanism. [5M]
 b) Give a neat sketch of the straight line motion 'Hart mechanism.' Prove that it produces an exact straight line motion. [5M]

8. A cam with 30 mm minimum radius is rotating clockwise at 1200 rpm to give the follower motion to a roller follower of 20 mm diameter. [10M]
 i. Lift = 25 mm
 ii. Follower rises during 120° cam rotation with SHM.
 iii. Follower to dwell for 60° cam rotation.
 iv. Follower to return 90° cam rotations with uniform acceleration and deceleration.
 v. Follower to dwell for remaining period.
 Draw the profile of the cam and determine maximum velocity and acceleration during rise and return stroke.

OR

9. Draw the profile of a cam operating a roller reciprocating follower and with the following data: Minimum radius of cam = 25 mm; lift = 30mm; Roller diameter = 15mm. The cam lifts the follower for 120° with SHM, followed by a dwell period of 30° . Then the follower lowers down during 150° of cam rotation with uniform acceleration and retardation followed by a dwell period. If the cam rotates at a uniform speed of 150 RPM. Calculate the maximum velocity and acceleration of follower during the descent period. [10M]

10. Two involute gears of 20° pressure angle are in mesh. The number of teeth on Pinion is 20 and the gear ratio is 2. The teeth have module is 5 mm and the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module. Find i) length of path of contact ii) Arc of contact and iii) Maximum velocity of sliding. [10M]

OR

11. In a reverted epicyclic gear train, the arm A carries two gears B and C and a Compound gear D - E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 r.p.m. clockwise. [10M]


