



**B.Tech III Semester Supplementary Examinations, July 2022**  
**KINEMATICS OF MACHINERY**  
*MECHANICAL ENGINEERING*

**Maximum Marks: 70**

Date: 23.07.2022 Duration: 3 hours

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

**Part-A**

All the following questions carry equal marks (10x2M=20 Marks)

- 1 Distinguish between a machine and mechanism. How do they differ?
- 2 Define kinematic link, kinematic pair and kinematic chain.
- 3 State and explain Kennedy's theorem.
- 4 Explain the velocity diagram of a rigid link by graphical method.
- 5 What is straight line mechanism and state the basic principle for straight line generating mechanisms.
- 6 Define Hooke's joint and write the applications of Hooke's joint.
- 7 Define cam and follower. Write the different types of cams.
- 8 Why a roller follower is preferred to that a knife edged follower? Explain in brief.
- 9 What is interference and undercutting? What are the methods to avoid interference and undercutting?
- 10 State and explain law of gearing.

**Part-B**

Answer All the following questions. (10M X 5=50Marks)

- 11 Define Inversion. Sketch and explain the inversions of a four bar mechanism 10  
OR
- 12 Describe with a neat sketch the working of an Elliptical trammel is an inversion of double slider crank chain. Prove that the path traced by a link of the mechanism is an ellipse. 10
- 13 In a four bar chain ABCD, AD is fixed and 150mm long, the crank AB is 40mm long and rotates at 120rpm. while the link CD=80mm oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD=60° 10  
OR
- 14 The crank of a slider crank mechanism is 15cm and the connecting rod is 65cm long, the crank makes 310 rpm in the C.W direction when it has turned through 45° from IDC position, locate all the instantaneous centers and determine the velocity of the slider and angular velocity of connecting rod. 10
- 15 A Hooke's joint is used to connect two shafts whose axes are out of line by 25°. The driving shaft rotates uniformly at 150 rpm. The driven shaft has attached masses of 200 kg at radius of gyration of 150mm. If a steady torque of 490 N-m resists rotation of the driven shaft, determine the

- a. The torque required at the driving shaft when  $\theta = 45^\circ$ . The angle  $\theta$  is measured from the position when the driven shaft fork lies in plane of the shafts
- b. The maximum angular acceleration of the driven shaft
- c. The minimum and maximum angular speed of driven shaft
- d. The values of angle between the shaft for total fluctuation angular speed of 30 rpm
- OR
- 16 Define steering gear mechanism and derive the condition for correct steering in Davis steering gear mechanism. 10
- 17 A cam rotation with uniform speed is required to give the following motion to a knife edged follower The outstroke of the follower is 40 mm for  $60^\circ$  of cam rotation Dwell period for next  $30^\circ$  of cam rotation The return stroke during next  $60^\circ$  of cam rotation Dwell period for the remaining  $210^\circ$  of cam rotation. The minimum radius of cam is 50 mm. The follower moves with uniform velocity for both outstroke and return stroke. Draw the cam profile when the follower passes through the axis of cam shaft. 10
- OR
- 18 Draw the profile of a cam to raise a valve with S.H.M through 40 mm in  $1/4^{\text{th}}$  of revolution. Keep it fully raised through  $1/10^{\text{th}}$  revolution and to lower it with uniform acceleration and retardation in  $1/6^{\text{th}}$  revolution. The valve remains closed during the rest of the revolution. The diameter of roller is 20 mm and the minimum radius of the cam to be 30 mm. The axis of the valve rod passes through the axis of cam shaft. The cam shaft rotates at 360 rpm clockwise. Determine maximum velocity and acceleration during outstroke and return stroke. 10
- 19 (a). State and explain the law of gearing with a neat sketch. 10  
(b). What is higher pair? How the gears are classified?
- OR
- 20 The arm of an epicyclic gear train rotates at 100 rpm in anticlockwise direction. The arm carries two wheels A and B having 36 and 45 teeth respectively. The wheel A is fixed and the arm rotates about the centre of wheel A. Find the speed of wheel B. What will be the speed of B, if the wheel A instead of being fixed, makes 200 rpm clockwise? 10