



R20 Regulation

**TKR COLLEGE OF ENGINEERING AND TECHNOLOGY**

(Autonomous, Accredited by NAAC with 'A' Grade)

Subject code:3P4CC

**B.Tech IV Semester Regular Examinations, July 2022**

**KINEMATICS OF MACHINERY**

(Mechanical Engineering)

Maximum Marks: 70

Date:26.07.2022

Duration: 3 hours

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 Differentiate machine and structure.
- 2 Classify kinematic pair according to the type of contact.
- 3 State Kennedy's three center theorem.
- 4 What are the types of instantaneous center?
- 5 State the basic principle of straight line generating mechanisms.
- 6 What is velocity ratio in Hooke's joint design?
- 7 List the application of cam mechanism in IC engine.
- 8 What is undercutting in cams?
- 9 Write the advantage when arc of recess is equal to arc of approach in meshing gears.
- 10 Compare a simple and compound gear train.

Part-B

Answer All the following questions.

(10MX 5=50Marks)

- 11 Sketch and explain the inversions of a four-bar chain. [10]  
OR
- 12 Discuss the different types of constrained motion with suitable examples. Add a note on quick return mechanisms. [10]
- 13 In a four-bar mechanism ABCD, the link lengths are as follows: Input link AB = 25 mm; Coupler link BC = 85 mm; Output link CD = 50 mm; Frame AD = 60 mm. The angle between the frame and the output link is  $100^\circ$  measured anticlockwise. The crank AB rotates at 50 rad/s in the clockwise direction. (a) Sketch the mechanism (b) Find the angular velocity of links BC and CD (c) Determine the angular acceleration of links BC and CD. [10]  
OR
- 14 Explain the concept of Coriolis component of acceleration with neat sketches. Derive the expression and give its direction for various conditions. [10]
- 15 Explain any one steering gear mechanism with a neat sketch. [10]  
OR
- 16 Two shafts with an included angle of  $165^\circ$  are connected by a Hooke's joint. The driving shaft runs at a uniform speed of 1200 rpm. The driven shaft carries a flywheel of mass 10 kg and 100 mm radius of gyration. Find the maximum angular acceleration of the driven shaft and the maximum torque required. [10]

- 17 A cam is required to give motion to a knife-edged follower as below: [10]
- Follower to move outwards through 25 mm during 120° of cam rotation;
  - Follower to dwell for the next 60° of cam rotation;
  - Follower to return its starting position during next 90° of cam rotation;
  - Follower to dwell for the rest of the cam rotation.

The minimum radius of cam is 50 mm. The displacement of the follower is to take place with simple harmonic motion during both the outward and return strokes. The line of stroke of follower passes through the axis of the camshaft. (a) Draw the displacement diagram (b) Draw the profile of cam.

OR

- 18 Draw the profile of a cam to raise a valve with SHM through 40 mm in 1/4<sup>th</sup> of revolution. Keep it fully raised through 1/10<sup>th</sup> revolution and to lower it with uniform acceleration and retardation in 1/6<sup>th</sup> revolution. The valve remains closed during the rest of 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 In an epicyclic gear train, the members are fixed sun gear, S, with 50 teeth, planet gear, P, with 20 teeth and the arm, A, which carries the planet. The arm rotates about the sun gear axis at 50 rpm in clockwise rotation. (a) Sketch the arrangement (b) Determine the speed of the planet gear and its direction of rotation. [10]

OR

- 20 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 10 mm addendum. Find the length of path of approach, the length of path of recess, the length of path of contact, the length of arc of contact and contact ratio. [10]