

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B.Tech. Winter 2022-23 Examination**

**Semester: 3****Subject Code: 203109207****Subject Name: Kinematics and Theory of Machines****Date: 11/10/2022****Time: 02:00 pm to 04:30 pm****Total Marks: 60****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1 Objective Type Questions - (All are compulsory) (Each of one mark) (15)**

1. What is "Inversions" with reference to mechanisms?
2. In mechanism, Number of Instantaneous centers are given by the formula \_\_\_\_\_.
3. Define Kennedy's Theorem regarding I-Centers.
4. The Kutzbach criterion for determining the number of degrees of freedom (n) is (where l = number of links, j = number of joints and h = number of higher pairs)
  - a.)  $n = 3(l-1) - 2j - h$     b.)  $n = 2(l-1) - 2j - h$     c.)  $n = 3(l-1) - 3j - h$     d.)  $n = 2(l-1) - 3j - h$
5. Which gear is used for connecting two coplanar and intersecting shafts?
  - a.) Spur gear    b.) Helical gear    c.) Bevel gear    d.) None of the above
6. A fixed gear having 200 teeth is in mesh with another gear having 50 teeth. The two gears are connected by an arm. The number of turns made by the smaller gear for one revolution of arm about the centre of bigger gear is
  - a.) 2    b.) 4    c.) 3    d.) None of the above
7. Module of a gear is
  - a.) D/T    b.) T/D    c.) 2D/T    d.) 2T/D
8. Oldham's coupling is an inversion of the kinematic chain used in
  - a.) Whitworth quick return mechanism    b.) Elliptical trammel
  - c.) Rotary engine    d.) Universal joint
9. Whirling speed of the shaft is the speed at which shaft tends to vibrate vigorously in \_\_\_\_ direction.
10. The frictional torque transmitted in a flat pivot bearing, assuming uniform wear, is \_\_\_\_\_.
11. A pulley and belt in a belt drive form a \_\_\_\_\_ pair.
12. Enlist the different factors on which the capacity of brake depends.
13. Explain the Term: Lower Pair and Higher Pair.
14. Which type of gears are used to connect two non-parallel non-Intersecting shaft?
15. What is the product of diametral pitch and circular pitch?

**Q.2 Answer the following questions. (Attempt any three) (15)**

- A) For Governor, Define (i) Hunting (ii) Sensitiveness (iii) Power of Governor (iv) Isochronism (v) Stability
- B) What are the types of Motion? Explain each in detail.
- C) Explain the effect of gyroscopic couple on four wheel drive.
- D) State and Prove "Law of gearing".

**Q.3 A) Draw the displacement diagrams for a follower when it moves with (i) Uniform Velocity Motion (07)**

(ii) Simple Harmonic Motion.

**B) Define terms related to gears: (i) Module (ii) Pressure Angle (iii) Circular Pitch (iv) Backlash. (08)****OR****B) Design a Displacement Diagram and Cam Profile using the following data: (08)**

Knife Edge follower is having Angle of Ascent=150 Degree, Angle of Dwell=40 Degree and Angle of Descent=60 Degree. Maximum Follower Lift is 30mm. Rise of the follower is SHM while Fall of the follower is Uniform Velocity. Radii of the base circle is 50mm. Take the appropriate scale wherever is necessary.

**Q.4 A) What is meant by the term 'Interference' in involute gears? Discuss various Methods used to avoid interference. (07)****OR****A) Define kinematic pairs. And give detailed classification. (07)****B) Explain with sketches the different types of cams and followers. (08)**