

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV EXAMINATION – SUMMER 2025****Subject Code:3144102****Date:17-05-2025****Subject Name:Kinematics and Dynamics of Machines****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Differentiate between Machine and Structure.	03
	(b) Write the relation between the number of instantaneous centre and the number of links in a mechanism.	04
	(c) In a slider-crank mechanism, the length of crank OB and connecting rod AB are 125 mm and 500 mm respectively. The centre of gravity G of connecting rod is 275 mm from slider A. The crank speed is 600 rpm clockwise. When the crank has turned 45° degree from inner-dead centre position, determine velocity of slider A, velocity of point G and angular velocity of the connecting rod AB.	07
Q.2	(a) What are the different motions of the follower?	03
	(b) State the law of Gearing.	04
	(c) An open belt running over two pulleys 240 mm and 600 mm diameter connects two parallel shafts 3 meters apart and transmits 4 kW from the smaller pulley that rotates at 300 r.p.m. Co-efficient of friction between the belt and the pulley is 0.3 and the safe working tension is 10 N per mm width. Determine (i) Minimum width of the belt. (ii) Initial belt tension, and (iii) Length of the belt required.	07
OR		
	(c) Explain the method of balancing of several masses in different planes.	07
Q.3	(a) What do you mean by Degrees of Freedom?	03
	(b) Define kinematic pair and classify it according to the types of contact.	04
	(c) Sketch and explain the three inversions of four-bar chain.	07
OR		
Q.3	(a) Define: Resonance, logarithmic decrement and magnification factor.	03
	(b) Explain the working of two different types of Quick-Return Mechanisms.	04
	(c) In a four bar chain ABCD, AD is fixed and is 15 cm long. The crank AB is 4 cm long and rotates at 120 rpm clockwise, while the link CD (whose length is 8 cm) oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60°.	07
Q.4	(a) What are the different types of cams?	03

- (b) Compare Belt, Rope and Chain drives. 04
- (c) Draw the displacement, velocity and acceleration diagram for a follower when it moves with simple harmonic motion? 07
- OR**
- Q.4** (a) What are the methods to avoid interference in Gear? 03
- (b) Sketch an Epicyclic gear train. 04
- (c) Derive an expression to determine the length of path of contact between two spur gear of different size. 07
- Q.5** (a) What is gyroscopic torque? 03
- (b) Explain Types of Vibrations. 04
- (c) Derive the differential equation of motion for a free damped vibration. 07
- OR**
- Q.5** (a) What is the Gyroscopic Effect on Naval Ships? 03
- (b) Explain Vibration Isolation and Transmissibility 04
- (c) A cam is designed for a knife edge follower with following data: 07
- Cam lift = 40 mm during 90° of cam rotation with SHM.
 - Dwell for next 30° .
 - During the next 60° of cam rotation, the cam follower returns to original position with SHM.
 - Dwell for the remaining 180° .
 - Draw the profile of the cam when the line of stroke is offset 20 mm from the axis of the camshaft. Radius of base circle of Cam is 40 mm.
