Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 4 – EXAMINATION – SUMMER 2026

Subject Code: 3144102 **Date: 16/06/2026**

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.**

Q.1	**(a)**	Define degree of freedom with examples.	**03**
	(b)	Explain the procedure to find instantaneous center of a four-bar mechanism.	**04**
	(c)	Analyze acceleration of a slider in a crank-slider mechanism using Klein's construction.	**07**
Q.2	**(a)**	List different types of kinematic pairs and give one example of each.	**03**
	(b)	Explain approximate Straight Line Mechanism.	**04**
	(c)	Derive the mobility of a given mechanism using Kutzbach criterion.	**07**
		OR	
Q.2	**(c)**	Compare epicyclic gear train and simple gear train with appropriate velocity ratio derivation.	**07**
Q.3	**(a)**	What is slip and creep in belt drives?	**03**
	(b)	Derive the expression for length of an open belt drive.	**04**
	(c)	Analyze condition for maximum power transmission in belt drive with necessary derivation.	**07**
		OR	
Q.3	**(a)**	Define velocity ratio and list factors affecting it in open belt drive.	**03**
	(b)	Explain undercutting and interference in involute gear profile.	**04**
	(c)	Design a cam profile for a radial follower given motion requirements (rise, dwell, return) with uniform acceleration motion and follower lift.	**07**
Q.4	**(a)**	List different types of followers used in cam mechanisms.	**03**
	(b)	Explain the significance of pressure angle in cam design.	**04**
	(c)	Explain Vibration Isolation and Transmissibility.	**07**
		OR	
Q.4	**(a)**	State Law of Belting.	**03**
	(b)	Differentiate between simple gear train and compound gear train with applications.	**04**
	(c)	Analyze the effect of follower motion types on cam profile shapes.	**07**
Q.5	**(a)**	Define gyroscopic couple. Give its unit.	**03**
	(b)	Derive the equation of motion for free vibration of a single degree of freedom system.	**04**

	(c)	Evaluate the response of a damped vibration system subjected to harmonic force. Derive expression for amplitude and phase angle.	**07**

OR

Q.5	**(a)**	What is magnification factor in forced vibrations?	**03**
	(b)	Explain the gyroscopic effect on a naval ship during pitching.	**04**
	(c)	Analyze the effect of unbalanced reciprocating masses in single cylinder engine and derive the expression for primary and secondary unbalanced forces.	**07**

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