Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 3 – EXAMINATION – SUMMER 2026

Subject Code: 3132505 **Date: 02/07/2026**

Subject Name: Kinematics and Dynamics of Machines

Time: 02:30 PM TO 05:00 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)**	Explain Grubler's criterion with one example.	**03**
	(b)	Explain the difference between the machine, mechanism and structure.	**04**
	(c)	With sketch, explain Crank and slotted lever quick return motion mechanism.	**07**
Q.2	**(a)**	List out the methods for determining the velocity and acceleration of link in mechanism.	**03**
	(b)	Explain all types of instantaneous centers.	**04**
	(c)	Explain Velocity Analysis of a Slider Crank Mechanism.	**07**
		OR	
Q.2	**(c)**	ABCD is a four-bar chain with link AD fixed. The lengths of the links are AB = 60 mm; BC = 170 mm; CD = 100 mm; and AD= 200 mm. The crank AB rotates at 10 rad/s clockwise. Draw the velocity diagram when angle BAD = 60° and B and C lie on the same side of AD. Find the angular velocity of links BC and CD.	**07**
Q.3	**(a)**	Draw only displacement diagram when follower moves with simple harmonic motion assuming suitable data.	**03**
	(b)	List all types of cam & followers with figure.	**04**
	(c)	Draw the profile of a cam operating a roller follower of 40 cm diameter from the following data: (1) It lifts the follower through 4 cm during 60° rotation with S.H.M. (2) The follower remains at rest for next 45° of cam rotation. (3) The follower is then descent to its original position during 90° of cam rotation with uniform acceleration and retardation. (4) It remains at rest for the rest of cam rotation. Least radius of cam is 4 cm, rotates at 200 r.p.m.	**07**
		OR	
Q.3	**(a)**	Classify belt drive and discuss factors to be considered for selection of belt drive.	**03**
	(b)	Write advantages and disadvantages of Chain Drive and Rope Drive.	**04**
	(c)	Explain law of belting and derive an equation for belt tension ratio.	**07**
Q.4	**(a)**	Define: Speed ratio, Contact Ratio and Length of the arc of contact.	**03**
	(b)	Explain reverted gear train and its applications.	**04**
	(c)	A pinion having 18 teeth engages with an internal gear having 72 teeth. Gears have involute profiled teeth with 20° pressure angle, module of 4 mm and the addenda on pinion and gear are 8 mm and 4 mm respectively. Find the length of path of contact.	**07**
		OR	

Q.4	**(a)**	Define: axis of precession, axis of spin, and axis of gyroscopic couple.	**03**
	(b)	Explain gyroscopic effect on naval ships during pitching.	**04**
	(c)	Explain gyroscopic effect on Airplane considering all the cases of direction of propeller and airplane itself.	**07**
Q.5	**(a)**	List three applications of balancing.	**03**
	(b)	Explain Static balancing and dynamic balancing in short.	**04**
	(c)	The four masses m1, m2 m3 and m4 having their radii of rotation as 300 mm, 200 mm, 250 mm and 100 mm are 200 kg, 300 kg, 250 kg and 100 kg in magnitude respectively. The angles between the successive masses are 45˚, 75˚ and 135˚ respectively. Find the position and magnitude of the balance mass required, if its radius of rotation is 100 mm. Use any methods.	**07**

OR

Q.5	**(a)**	Write short note vibration isolation.	**03**
	(b)	Write the difference between Natural vibration, Forced vibration and Damped vibration.	**04**
	(c)	Explain free vibration of under damp system in detail.	**07**

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