

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-III EXAMINATION – WINTER 2025****Subject Code:3132505****Date:22-12-2025****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) What is the rationale for learning the subject of Kinematics and Dynamics of Machines?	03
	(b) Give two differences between (i) Machine and Structure (ii) Lower Pair and Higher Pair	04
	(c) Classify different straight-line motion mechanisms. With a neat sketch any ONE exact straight-line motion mechanism.	07
Q.2	(a) Differentiate between (i) Displacement (ii) Velocity (iii) Acceleration of Mechanism	03
	(b) Explain the following (i) Rubbing Velocity (ii) Instantaneous center.	04
	(c) In an IC engine mechanism, the crank is 50 mm long and the connecting rod is 200 mm long. The crank makes an angle of 45° with the I.D.C. Locate all the possible instantaneous centers of rotation for this.	07
	OR	
	(c) In a slider crank mechanism, the stroke of the slider is 200 mm and the length of the connecting rod is 450 mm. The crank rotates uniformly at 400 rpm clockwise; while the crank is approaching the I.D.C. and the connecting rod is normal to the crank, find the velocity of the piston.	07
Q.3	(a) Why the roller follower is preferred to the knife edge follower?	03
	(b) Define the following terms as applied to the cam with the neat sketch (i) Base Circle (ii) Pitch Circle (iii) Pressure Angle (iv) Stroke of the follower.	04
	(c) Draw the cam profile operating a knife-edged follower from the following data: (i) Follower to move out through a distance of 20 mm during 120° (ii) Follower to dwell for the next 60° (iii) Follower to return to its initial position during 90° (iv) Follower to dwell the remaining cam rotation. The cam rotates at 500 rpm clockwise. The minimum radius of the cam is 50 mm and the axis of the camshaft and the follower moves with uniform velocity during both the outstroke and the return stroke.	07
	OR	
Q.3	(a) Give a brief classification of chain drive.	03
	(b) What are the sleep of the belt and the creep of the belt?	04
	(c) Derive the equation for centrifugal tension in the belt drive with the usual notation.	07
Q.4	(a) Give examples of parallel axis gear and intersecting axes gear.	03
	(b) Explain the term train value and velocity ratio used in the gear train.	04
	(c) The number of teeth on each of the two equal spur gears in the mesh is 40. The module is 6mm and the teeth have a 20° involute profile. If the arc of contact is 1.75 times the circular pitch, find the addendum.	07

OR

- Q.4** (a) Discuss the phenomenon of the gyroscopic couple. **03**
(b) Explain the effect of a gyroscopic couple on an aeroplane when aeroplane is taking a left turn. **04**
(c) Differentiate between **07**
(i) Static balancing and dynamic balancing
(ii) Rotary mass balancing and Reciprocating mass balancing
- Q.5** (a) What are the causes and effects of vibrations? **03**
(b) Explain the critical or whirling speed of the shaft. **04**
(c) Considering an equilibrium method deduce an expression for finding the natural frequency of free longitudinal vibrations. **07**

OR

- Q.5** (a) How the vibrations can be isolated? **03**
(b) Deduce the expression for torsionally equivalent shaft. **04**
(c) A shaft of 100 mm diameter and 1 meter long has one of its ends fixed and the other end carries a disc of mass 500 kg at a radius of gyration of 450 mm, The modulus of rigidity for the shaft material is 80 GN/m². Determine the frequency of torsional vibrations. **07**
