

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III(NEW) EXAMINATION – SUMMER 2023****Subject Code:3132505****Date:01-08-2023****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.

		MARKS
Q.1	(a) Define 'Kinematics' and 'Dynamics' of machine.	03
	(b) Distinguish between mechanism and machine.	04
	(c) Differentiate between (i) Lower pair and Higher Pair (ii) Self-closed pair and Force Closed Pair	07
Q.2	(a) What is velocity of rubbing? How is it found?	03
	(b) What are centripetal and radial components of acceleration? When do they occur? How are they determined?	04
	(c) A linkage has 11 links and 4 loops. Calculate the degrees of freedom and the number of ternary and quaternary links it will have if it has only single turning pairs.	07
	OR	
	(c) In a slider-crank mechanism the crank is 480 mm long and rotates at 20 rad/s in the anti-clockwise direction. The length of the connecting rod is 1.6 m. When the crank turns 60° from the inner-dead centre, determine the (i) velocity of the slider (ii) angular velocity of the connecting rod.	07
Q.3	(a) What types of gears are used for parallel, intersecting and skew shafts? Explain	03
	(b) State and derive the law of gearing.	04
	(c) Each of two gears in a mesh has 48 teeth and a module of 8 mm. The teeth are of 20° involute profile. The arc of contact is 2.25 times the circular pitch. Determine the addendum.	07
	OR	
Q.3	(a) What is a reverted gear train? Where is it used?	03
	(b) What is the difference between a simple gear train and a compound gear train? Explain with the help of sketches.	04
	(c) An epicyclic gear train consists of an arm and two gears A and B having 30 and 40 teeth respectively. The arm rotates about the centre of the gear A at a speed of 80 rpm anti-clockwise. Determine the speed of the gear B if (i) the gear A is fixed, and (ii) the gear A revolves at 240 rpm clockwise instead of being fixed. Also draw schematic diagram.	07
Q.4	(a) What are free, damped and forced vibrations? How are they caused?	03
	(b) What is meant by magnification factor in case of forced vibrations? On what factors does it depend?	04
	(c) A vibrating system consists of a mass of 50 kg. A spring with a stiffness of 30 KN/m and a damper. The damping provided is only 20% of the critical value. Determine the (i) damping factor (ii) critical damping coefficient (iii) natural frequency of damped vibrations.	07
	OR	
Q.4	(a) What do you mean by spin, precession and gyroscopic planes?	03
	(b) What is meant by static and dynamic unbalance in machinery? How can	04

he balancing be done?

- (c) A circular disc mounted on a shaft carries three attached masses of 4 kg, 3 kg and 2.5 kg at a radial distance of 75 mm, 85 mm and 50 mm and at the angular positions of 45° , 135° and 240° respectively. The angular positions are measured counter clockwise from the reference line along the X-axis. Determine the amount of the counter mass at a radial distance of 75 mm required for the static balance. **07**
- Q.5** (a) What are the advantage and disadvantage of chain drive? **03**
- (b) Explain in what way the gyroscopic couple affects the motion of an aircraft while taking turn. **04**
- (c) A belt runs over a pulley of 800 mm diameter at a speed of 180 rpm. The angle of lap is 165° and the maximum tension in the belt is 2kN. Determine the power transmitted if the coefficient of friction between the belt and the pulley is 0.3. **07**

OR

- Q.5** (a) What is cam? What types of motion can be transmitted with a cam and follower combination? **03**
- (b) Define the term vibration isolation and transmissibility. **04**
- (c) Draw the profile of a cam operating a knife edge follower having a lift of 30 mm. The cam raises the follower with SHM for 150° of the rotation followed by a period of dwell for 60° . The follower descends for the next 100° rotation of the cam with uniform velocity, again followed by a dwell period. The cam rotates at a uniform velocity of 120 rpm and has a least radius of 20 mm. **07**
