Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(NEW) EXAMINATION – WINTER 2022

Subject Code:2142504 Date:19-12-2022

Subject Name:Theory 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)**	How mechanism, machine and structure are distinguished from each other.	**03**
	(b)	With example explain successfully constrained motion, completely constrained machine and incompletely constrained motion.	**04**
	(c)	How to obtain inversion of mechanism? Explain any ONE inversion of mechanism with neat sketch.	**07**
Q.2	**(a)**	What do you mean by straight line mechanisms? Draw only a sketch of peaucelier mechanism.	**03**
	(b)	Sketch a pentograph,explain its working and show that it can be used to reproduce to an enlarged scale a given figure.	**04**
	(c)	What is the condition of correct steering? Explain Davis steering gear mechanism.	**07**
		OR	
	(c)	The angle between the axes of two shafts connected by Hooke's joint is 18°. Determine the angle turned through by the driving shaft when the velocity ratio is maximum & unity.	**07**
Q.3	**(a)**	Define rubbing velocity ar a pin joint. What will be rubbing velocity when the two links move in same & opposite directions?	**03**
	(b)	Determine an expression for the magnitude and direction of coriolis component of acceleration.	**04**
	(c)	In four bar chain ABCD, AD is fixed and 150 mm long. The crank AB is 40mm long and rotates at 120 rpm clockwise, while the link CD=80 mm oscillate about D. BC & AD are of equal length. Find the angular velocity of link CD when angle BAD=60°.	**07**
		OR	
Q.3	**(a)**	What do you understand by coupler curve.	**03**
	(b)	Explain synthesis of mechanism with example.What so you understand by number synthesis & dimensional synthesis.	**04**
	(c)	A four bar mechanism is to be designed by using three precision points to generate a function $Y = X^{1.5}$ in the range $1 \leq X \leq 4$. Find the value of X,Y corresponding to three precision points.	**07**
Q.4	**(a)**	What is the function of friction clutch?Enlist types of clutch.	**03**
	(b)	Explain (i) Angle of Repose (ii) Limiting angle of friction	**04**
	(c)	Describe with the help of neat sketch the principle of operation of an internal expanding shoe brake. Derive the expression for the braking torque.	**07**

OR

Q.4	**(a)**	What do you mean by centrifugal tension of the belt.	**03**
	(b)	Differentiate between self energizing and self locking brake.	**04**
	(c)	An open belt is running over two pulleys 240 mm & 600 mm diameter connects two parallel shafts 3 meters apart & transmits 4 Kw from the smaller pulley that rotates at 300 rpm. Coefficient of friction between the belt is 0.3 & the safe working tension is 10 N per mm width. Determine (i) Minimum width of the belt (ii) Initial belt tension (iii) Length of the belt required	**07**
Q.5	**(a)**	What are the application of epicyclic gear train?	**03**
	(b)	In which gear train must have same circular pitch or module ? Why? Derive train value & speed ratio for the same.	**04**
	(c)	A pair of gears having 40 and 20 teeth respectively are rotating in mesh, the speed of the smaller being 2000 rpm. Determine the velocity of sliding between the gear teeth faces at the point of engagement,if the smaller gear is driver. Assume that the gear teeth are 20° involute form,addendum length is 5 mm & module is 5 mm.	**07**

OR

Q.5	**(a)**	Give classification of cam.	**03**
	(b)	Explain given terms with reference to cam (i) Prime Circle (ii) Base Circle (iii) Pitch Circle	**04**
	(c)	It is required to set out the profile of a cam to give the following motions to the reciprocating follower with a flat mushroom contact face: (i) Follower to have a stroke of 20 mm during 120° of cam rotation; (ii) Follower to dwell for 30° of cam rotation; (iii) Follower to return to its initial position during 120° of cam rotation; and (iv) Follower to dwell for remaining 90° of cam rotation. The minimum radius of the cam is 25 mm. The out stroke of the follower is performed with SHM & the return stroke with equal uniform acceleration and retardation.	**07**

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