

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2023****Subject Code:2142504****Date:21-07-2023****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) Define “Theory of Machine”.	03
	(b) How an inversion of mechanism can be defined? Explain any one inversion of single slider crank chain mechanism.	04
	(c) What is relative velocity? Explain step by step procedure of drawing a velocity diagram for single slider crank chain mechanism.	07
Q.2	(a) Elaborate kinematic synthesis of mechanism.	03
	(b) What do you mean by lower pair? Explain any one straight line mechanism.	04
	(c) Explain Freudenstein’s method of three point synthesis of mechanisms.	07
	OR	
	(c) With the neat sketch of hook’s joint derive the ratio of shaft velocities.	07
Q.3	(a) Describe any three laws of static friction.	03
	(b) What is the function of friction clutch? Deduce the equation of total frictional torque considering uniform pressure.	04
	(c) Two pulleys, one 450 mm diameter, & the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley.	07
	OR	
Q.3	(a) Name three types of displacement diagram for different condition of follower.	03
	(b) Define (i) Pitch Circle (ii) Base Circle (ii) Prime circle	04
	(c) A Cam is to give outstroke of 60° of cam rotation, dwell for next 30°, Return stroke during next 60° of cam rotation & Dwell for the remaining 210° of cam rotation motion to a knife-edge follower. Draw only a displacement diagram considering 40 mm as the stroke of the follower when follower moves with uniform velocity during both outstroke and return stroke of the follower.	07

- Q.4** (a) Differentiate between spur gear and helical gear. **03**
 (b) Give two advantages of (i) Involute Gear (ii) Cycloidal Gear. **04**
 (c) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gear is 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio. **07**

OR

- Q.4** (a) Differentiate between simple gear train and compound gear train. **03**
 (b) With the neat sketch explain epicyclic gear train and its application. **04**
 (c) An internal wheel B with 80 teeth is keyed to a shaft F. A fixed internal wheel C with 82 teeth is concentric with B. A compound wheel D-E gears with two internal wheels. D has 28 teeth and gears with C while E gears with B. The compound wheels revolve freely on a pin which projects from a disc keyed to a shaft. A co-axial with F. Sketch the arrangement. Prepare a Table of Motions. **07**

- Q.5** (a) What is the function of Brake? Which materials are used for brake lining? **03**
 (b) What are the types of brakes? Explain single block brake with neat sketch. **04**
 (c) A band brake acts on the $\frac{3}{4}^{\text{th}}$ of the circumference of a drum of 450 mm diameter which is keyed to the shaft. The band brake provides a braking torque of 225 N-m. One end of the band is attached to a fulcrum pin of the lever and the other end to a pin 100 mm from the fulcrum, If the operating force is applied at 500 mm from the fulcrum and the coefficient of friction is 0.25, find the operating force when the drum rotates in the anticlockwise direction. **07**

OR

- Q.5** (a) Define structural error and mechanical error with respect to synthesis of mechanism. **03**
 (b) With neat sketch explain coriolis component of acceleration? What is its value? **04**
 (c) Differentiate between (i) Self closed pair (ii) Force closed pair. **07**
 Elaborate above difference by taking suitable example.
