

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-III (NEW) EXAMINATION – SUMMER 2021****Subject Code:3131906****Date:06/10/2021****Subject Name: Kinematics and Theory of Machine****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
<b>Q.1</b>	(a) Define the following terms: Link, Kinematic link, Kinematic chain	<b>03</b>
	(b) List quick return motion mechanisms with application.	<b>04</b>
	(c) Explain degree of freedom with neat sketch. Also State and explain Grashof's criterion.	<b>07</b>
<b>Q.2</b>	(a) List and describe the three phases of synthesis.	<b>03</b>
	(b) Construct two position synthesis of single slider crank mechanism by relative pole method.	<b>04</b>
	(c) Derive analytical expression for the displacement and velocity analyses of a slider crank mechanism.	<b>07</b>
<b>OR</b>		
	(c) A four bar mechanism is to be designed, by using three precision points, to generate the function $y = x^{1.5}$ , for the range $1 \leq x \leq 4$ . Assuming $30^\circ$ starting position and $120^\circ$ finishing position for the input link and $90^\circ$ starting position and $180^\circ$ finishing position for the output link. Find the values of $x$ , $y$ , $\theta$ and $\phi$ corresponding to the three precision points.	<b>07</b>
<b>Q.3</b>	(a) Define the following terms as applied to cam with a neat sketch: - Base circle, Pressure angle, and Pitch circle.	<b>03</b>
	(b) Classify "followers" and explain with neat sketch.	<b>04</b>
	(c) Draw the profile of a cam rotating in anti-clock wise direction and operating a knife edge follower when the axis of the follower passes through the axis of the cam shaft from following data: 1. Follower moves outwards through 30 mm during $90^\circ$ of cam rotation. 2. Follower dwells for next $120^\circ$ 3. Follower returns to its original position during next $150^\circ$ , 4. The displacement of the follower is to take place with SHM during outward stroke and with uniform velocity during inward stroke. 5. The least radius of the cam is 50 mm	<b>07</b>
<b>OR</b>		
<b>Q.3</b>	(a) Compare chain drive with rope drive.	<b>03</b>
	(b) Explain the phenomenon of "slip" and "creep" in a belt drive.	<b>04</b>
	(c) If two parallel shaft 6 m apart are to be connected by a belt running over a pulley of dia 600 mm and 400 mm respectively. Find exact and approx. lengths of belt when belt is open and when belt is crossed.	<b>07</b>

- Q.4** (a) Distinguish between the function of a clutch, brake and dynamometer. **03**
- (b) Derive an expression for the efficiency of an inclined plane when a body moves up a plane. **04**
- (c) A simple band brake is applied to a rotating drum of 500 mm diameter. The angle of lap of the band on the drum is  $260^\circ$ . One end of the band is attached to a fulcrum pin of the lever and other end is to a pin 100 mm from the fulcrum. If coefficient of friction is 0.25, and a braking force of 100 N is applied at a distance of 750 mm from the fulcrum, determine the braking torque when the drum rotates in anti-clock wise direction. **07**
- OR**
- Q.4** (a) What do you mean by interference in gear? **03**
- (b) For gear, Define: (1) Contact Ratio (2) Module (3) Circular pitch (4) Addendum. **04**
- (c) Derive an expression for the length of the path of contact in a pair of meshed spur gears. **07**
- Q.5** (a) Explain briefly the differences between simple, compound, and epicyclic gear trains. **03**
- (b) Explain compound gear train with neat sketch. **04**
- (c) Explain epicyclic gear train with the help of neat sketch. Write its merits and demerits as compared to reverted and compound gear trains. **07**
- OR**
- Q.5** (a) Discuss coriolis component of acceleration. **03**
- (b) Formulate freudenstein's equation. **04**
- (c) State and prove the law of gearing. Show that involute profile satisfies the conditions for correct gearing. **07**

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