Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3131906 Date:27-02-2023

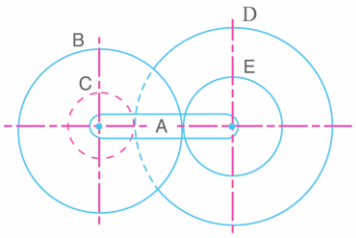
Subject Name:Kinematics and Theory of Machines

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.**

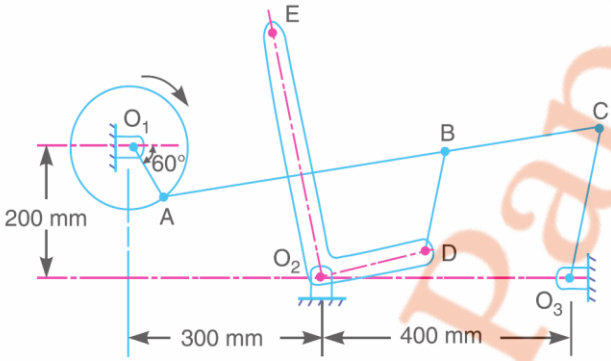
			Marks
Q.1	**(a)**	Differentiate Lower pair and Higher Pair	**03**
	(b)	Classify different types of constrained motions.	**04**
	(c)	Draw and explain Peaucellier mechanism and	**07**
Q.2	**(a)**	Classify different types of cams according to types of shape.	**03**
	(b)	Classify and draw different follower displacement diagram.	**04**
	(c)	Two involute gears of 20° pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2. If the pitch expressed in module is 5 mm and the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module, find the angle turned through by pinion when one pair of teeth is in mesh and the maximum velocity of sliding.	**07**
		OR	
	(c)	Construct cam profile for knife edge follower with offset to right by 15 mm. Minimum radius of the cam = 30 mm, stroke of the follower = 24 mm. angle of rise = 90^O, dwell after rise = 60^O, angle of return = 120^O, dwell after return for the rest of the period. Follower move outward with uniform velocity and return back with simple harmonic motion. The cam is rotating in clockwise direction.	**07**
Q.3	**(a)**	Explain the term coupler curves.	**03**
	(b)	Explain chebychev spacing method	**04**
	(c)	A four-bar chain mechanism is to be designed by using three precision points to generate the function $Y = X^{1.5}$ for the angle range $1 \leq x \leq 4$. Assuming 30^O starting position and 120^O finishing position for the input link and 90^O starting position and 180^O for finishing position for the output link, find the value of x, y, θ, Φ corresponding to three precision point.	**07**
		OR	
Q.3	**(a)**	State the law of gearing.	**03**
	(b)	Differentiate spur and helical gear.	**04**
	(c)	In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D - E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 r.p.m. clockwise.	**07**



Q.4 **(a)** Explain klein's construction. **03**

(b) Explain the term rubbing velocity. **04**

(c) The mechanism of a machine, as shown in Figure, has the following dimensions: O_1A = 100 mm, AC = 700 mm, BC = 200 mm, O_3C = 200 mm, O_2E = 400 mm, O_2D = 200 mm and BD = 150 mm. The crank O1A rotates at a uniform speed of 100 rad/s. Find the velocity of the point E of the bell crank lever by instantaneous center method. **07**

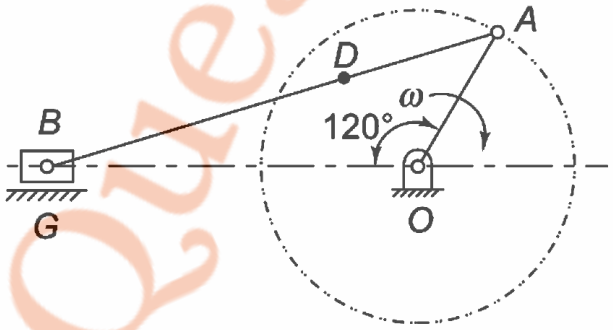


OR

Q.4 **(a)** State and explain aronhold- kennedy theorem. **03**

(b) Explain angular velocity, linear velocity, angular acceleration and linear acceleration. **04**

(c) Figure shows configuration of an engine mechanism. The dimensions are the following: Crank OA = 200 mm; Connecting rod AB = 600 mm; distance of center of mass from crank end, AD = 200 mm. At the instant, the crank has an angular velocity of 50 rad/s clockwise and an angular acceleration of 800 rad/s2. Calculate the (i) velocity of D and angular velocity of AB (ii) acceleration of D and angular acceleration of AB **07**



Q.5 **(a)** State the law of belting **03**

(b) Compare belt drive, rope drive and chain drive. **04**

(c) In an open-belt drive, the diameters of the larger and the smaller pulleys are 1.2 m and 0.8 m respectively. The smaller pulley rotates at 320 rpm. The center distance between **07**

the shafts is 4 m. When stationary, the initial tension in the belt is 2.8 kN the mass of the belt is 1.8 kg/m and the coefficient of friction between the belt and the pulley is 0.25. Determine the power transmitted.

OR

Q.5	**(a)**	Classify the different type of brakes.	**03**
	(b)	Explain the working of multi plate clutch with neat sketch.	**04**
	(c)	A rope drive transmits 600 kW from a pulley of effective diameter 4 m, which runs at a speed of 90 r.p.m. The angle of lap is 160°; the angle of groove 45°; the coefficient of friction 0.28; the mass of rope 1.5 kg / m and the allowable tension in each rope 2400 N. Find the number of ropes required.	**07**