

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

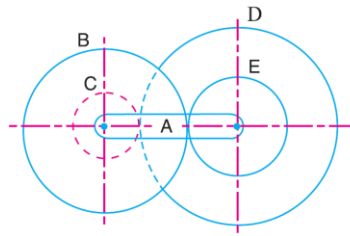
Time:02:30 PM TO 05:00 PM

Total Marks:70

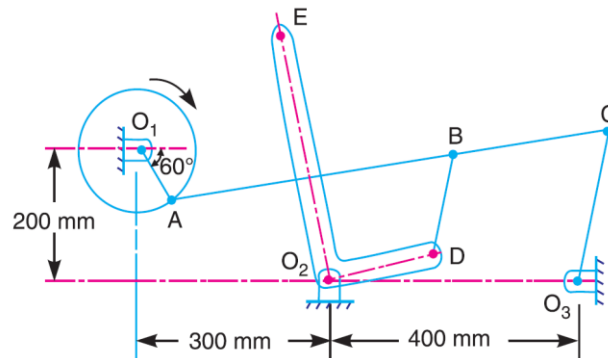
Instructions:

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° , dwell after rise = 60° , angle of return = 120° , 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° starting position and 120° finishing position for the input link and 90° starting position and 180° 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

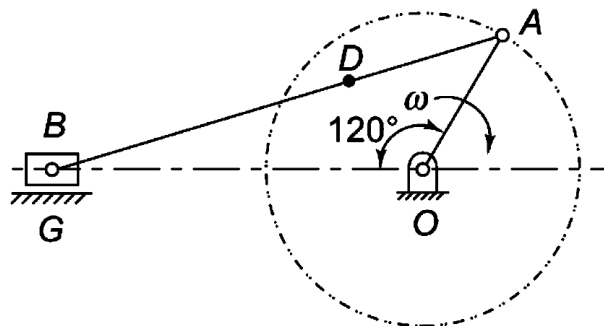


- Q.4** (a) Explain Klein's construction. **03**
 (b) Explain the term rubbing velocity. **04**
 (c) The mechanism of a machine, as shown in Figure, has the following dimensions: $O_1A = 100$ mm, $AC = 700$ mm, $BC = 200$ mm, $O_3C = 200$ mm, $O_2E = 400$ mm, $O_2D = 200$ mm and $BD = 150$ mm. The crank O_1A 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**