Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–III (NEW) EXAMINATION – WINTER 2024

Subject Code:3131906 Date:10-12-2024

Subject Name:Kinematics and 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.**

Q.1	**(a)**	Explain: Lower Pair, Degree of Freedom , Mechanical Advantage	**03**
	(b)	What is inversion ? Explain any one inversion of slider Crank chain	**04** **07**
	(c)	Explain Grubler crieteria of determing degree of freedom For mechanisms & for plane mechanism prove that minimum number of binary links in constrained mechanism with simple hinges is four.	
Q.2	**(a)**	With neat sketch explain space centroide & body centroide.	**03**
	(b)	What is instantaneous center ? Explain kenedys theorm for IC.	**04**
	(c)	Explain corroilis component and derive its equation in quick return mechanism.	**07**
		OR	
	(c)	A whth worth quick return motion mechanism shown in figure c . OA is a crank rotating at 30 rpm in clockwise direction.OA is 150 mm, OC= 100 mm, CD= 125 mm, DR = 500 mm. Determine the acceleration of sliding block R and angular acceleration of slotted lever CA.	**07**

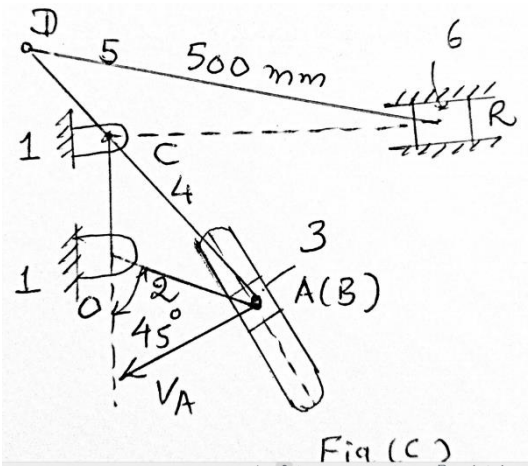

Fig (C)

Q.3	**(a)**	Explain terms: Type synthesis, Number synthesis, Dimensional synthesis	**03**
	(b)	Describe the classification of synthesis problem	**04**
	(c)	Draw the cam profile for a cam in which moves with SHM during ascent while it moves with uniformly accelerated motion during descent. Lift of follower 40 mm , least radius of cam 60 mm, angle of ascent 48° . angle of dwell between ascent and descent 42°, agle of descent 60°, diameter of roller 40 mm. Distance between axis of follower and axis of cam 20 mm. If cam rotates	**07**

at 360 rpm anticlockwise find maximum velocity and acceleration of follower during descent.

OR

Q.3 **(a)** Explain the effect of pressure angle in cam design. **03**

(b) Classify follower motion in cam and explain SHM in cam. **04**

(c) For four bar mechanism for three precesion points to generate a function $Y = X^{1.5}$ for range $1<=x<=4$. Assuming starting position 40° and finishing position 130° for input link and 100° starting position and 190° finishing position for the input link, find values of x,y, θ, φ corresponding to three precesion points. **07**

Q.4 **(a)** Explain phenomenon of slip and creep in belt **03**

(b) For flat belt drive derive $T_1/T_2 = e^{\mu\theta}$, where μ = coefficient of friction and θ is angle of contact. **04**

(c) Engine with 45 KW power at 1000 rpm is connected with cone clutch built inside the flywheel. Cone has face angle 12.5 and maximum mean diameter of 600 mm. The coefficient of friction is 0.2. The normal pressure on clutch face is not to exceed 0.1 N/mm^2. Find the axial spring force necessary to engage to clutch and face width required. **07**

OR

Q.4 **(a)** Explain limiting friction, angle of friction and coefficient of friction. **03**

(b) Derive expression for flat collar bearing Assume uniform intensity of pressure. **04**

(c) Two pulleys are 450 mm diameter and other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by cross belt. Find the length of belt required and angle of contact between the belt and each pulley. What power can be transmitted by belt when larger pulley rotates at 300 rpm. If the maximum permissible tension in belt is 1000 N and coefficient of friction between belt nad pulley is 0.25? **07**

Q.5 **(a)** What is self locking in brakes? Explain it in shoe brake. **03**

(b) Differentiate between involute and cycloidal gear. **04**

(c) What is law of gearing ? Derive the equation for sliding velocity in gear. **07**

OR

Q.5 **(a)** Explain Addendum, Module, Backlash in Gear **03**

(b) Write short note on differential gear box. **04**

(c) In an epicyclic gear train arm carries two gears A and B having 30 and 45 teeth respectively. If arm rotates at 150 rpm in clockwise direction about center of gear A which is fixed, Determine speed of gear B. If the gear A instead of being fixed makes 300 rpm in clockwise direction what will be speed of gear? **07**

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