

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-III (New) EXAMINATION – WINTER 2015

Subject Code:2131906

Date:02/01/2016

Subject Name: KINEMATICS OF MACHINES

Time: 2:30pm to 5:00pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

		MARKS
Q.1	Short Questions	14
	1 What do you understand by synthesis?	
	2 Differentiate lower pair and higher pair.	
	3 State Grashoff's criterion	
	4 Differentiate Linear acceleration and angular acceleration	
	5 How many degree of freedom a structure have?	
	6 If a point moves along a straight line which is rotating, what will be the tangential component of acceleration?	
	7 When crank rotates with uniform velocity then what will be the tangential acceleration?	
	8 Define Conjugate profile	
	9 Define : Backlash in Gear	
	10 What is the product of Circular Pitch and Diametral Pitch	
	11 What will be the minimum value of contact ratio for Gear?	
	12 In which gear train the axes of the first and last gear are co-axial?	
	13 Define the term pressure angle in cam	
	14 Why roller follower is preferred over a knife edge follower?	
Q.2	(a) Explain Limitations of Grubler's Criteria	03
	(b) Explain path generation.	04
	(c) A four bar chain mechanism is to be designed, by using three precision point to generate the function $y = x^{1.5}$ for the range $1 \leq x \leq 4$ Assuming 30° starting position and 120° finishing position for the input link and 90° starting position and 180° finishing position for the output link, find the value of x , y , θ and ϕ corresponding to three precision point.	07
	OR	
	(c) Derive the equation of displacement, velocity and acceleration of slider in a slider crank mechanism by analytical method	07
Q.3	(a) A crank and slotted lever mechanism used in a shaper has a centre distance of 300 mm between the centre of oscillation of the slotted lever and the centre of Rotation of the crank. The radius of the cranks is 120 mm. Find the ratio of the Time of cutting to the time of return stroke	04
	(b) The length of various links of a mechanism shown in Fig. are as follows: AB = DE = 150 mm, BC = CD = 450 mm, EF = 375 mm The crank AB makes an angle of 45° with horizontal and rotates about A in the clockwise direction at a uniform speed of 120 rpm. The lever DC oscillates about the fixed point D, which is connected to AB by the coupler. The block F moves in the horizontal guide, being driven by the link EF. Determine 1. Velocity of the block F 2. Angular velocity of DC, and 3. Rubbing speed at the pin C which is 50 mm in diameter.	10

Q.3	(a) The hook's joint connect two shafts whose axes are intersect. If the driving shaft rotates uniformly at 500 rpm and variation in the speed of driven shaft is not to exceed 6 % of mean speed, find the maximum possible inclination between two shafts.	03
	(b) Explain Angular Velocity Theorem	04
	(c) Derive an expression for the magnitude and direction of Coriolis component of acceleration	07

(b) Draw the profile of a cam rotating with an oscillating roller follower to the specification given below: **10**

1. Follower moves outwards through an angular displacement of 20° during first 120° of cam rotation.
2. Follower returns to its original position during next 120° of cam rotation
3. Follower to dwell during the rest of cam rotation.

The distance between the pivot center and roller center is 120mm, The distance between the pivot center and cam axis is 130mm , minimum radius of cam is 40mm, radius of roller is 10 mm The displacement of the follower is to take place with SHM during outward stroke and inward stroke

Q.4 (a) Draw the displacement, Velocity and Acceleration for follower when it moves with cycloidal motion. **04**

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- Q.5

(a)

Explain any three terminology of gear tooth with neat sketch.

03

(b)

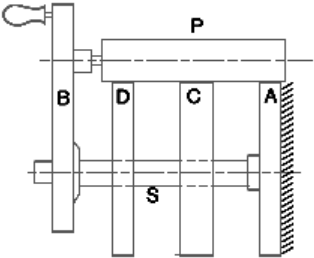
Explain with the neat sketch the “sun and planet wheel”.

04

(c)

Figure shows an epicyclic gear train knows as Ferguson’s paradox. Gear A is fixed to the frame and is, therefore, stationary. The arm B and gears C and D are free to rotate on the shafts S. Gear A, C and D have 100, 101 and 99 teeth respectively. The planet gear has 20 teeth. The pitch circle diameters of all are the same so that the planet gear P meshes with all of them. Determine the revolutions of gears C and D for one revolution of the arm B.

07



OR

- Q.5

(a)

What do you understand by the term “interference” as applied to the gear?

03

(b)

Explain with a neat sketch the “Differential Gear Box”

04

(c)

A pinion having 30 teeth drives a gear having 80 teeth. The profile of gear is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the contact ratio.

07
