

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2131906

Date: 09/06/2017

Subject Name: Kinematics of Machines

Time: 10:30 AM to 01:00 PM

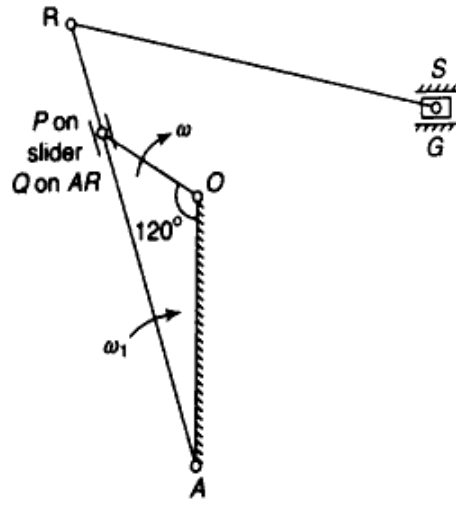
Total Marks: 70

Instructions:

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

		Marks
Q-1	Short Questions	14
1	Which of the following mechanism is used to enlarge or reduce the size of drawing? (a) Pantograph (b) Graphometer (c) Oscillograph (d) Clinograph	
2	A cylindrical Pair allows ____ degree of freedom (a) 2 (b) 3 (c) 4 (d) 1	
3	The kinematic chain having N links will have _____inversions (a) N-1 (b) N (c) N-2 (d) N-3	
4	A ball and socket Joint form a _____ pair.	
5	A negative degree of freedom for a linkage means (a) constrained motion (b) Unconstrained motion (c) Statistically indeterminate structure (d) none of these	
6	The total number of instantaneous centres for a mechanism containing n links is given by _____.	
7	The coriolis component of acceleration acts (a) parallel to sliding surface (b) Perpendicular sliding surface (c) at 45° to the sliding surface (d) none of these	
8	The moment on a pulley which produces the rotation of the pulley called (a) work (b) Energy (c) momentum (d) torque	
9	State the relation for centrifugal tension in belt.	
10	Hour and minute hand are connected in a clock mechanism by means of (a) simple gear train (b) Epicyclic train (c) Reverted gear train (d) Non of above	
11	The contact ratio for gears is_____. (a) zero (b) less than one (c) greater than one	
12	For gears : Diametral pitch X Circular pitch = _____	
13	Define Pitch point for Cam.	
14	Define Transmission angle	
Q.2	(a) Draw a neat sketch of following mechanism with proper notation of the links. 1. Four bar crank and lever mechanism. 2. Four bar rocker- rocker mechanism.	04
	(b) Differentiate between Machine and Structure with suitable example.	04
	(c) Explain inversion method of synthesis for four bar mechanism using Two point and Three Point.	06
	OR	
	(c) Explain Relative pole method of synthesis for slider crank mechanism using Two point and Three Point.	06
Q.3	(a) Derive an empirical relation for the velocity ratio of two shaft connected by Hook's Joint.	06

- (b) Figure shows the link mechanism of a quick return mechanism of the slotted lever type the various dimensions of which are
 $OA = 400$ mm, $OP = 200$ mm, $AR = 700$ mm, $RS = 300$ mm.
For the configuration shown, determine the velocity of cutting tool as S and angular velocity of the link RS. The crank OP rotates at 210 rpm.



OR

- Q.3 (a) Derive law of correct steering for Ackerman Steering Gear mechanism 06
(b) In a slider crank mechanism, the crank is 480 mm long and rotates at 20 rad/s in the counter clockwise direction. The length of connecting rod is 1.6 m. When the crank turns 60° from the inner dead centre, determine the 08
1. Velocity of slider
2. Velocity of point E located at a distance 450 mm on the connecting rod extended
- Q.4 (a) State the relation for Displacement, Velocity and Acceleration for following motion of follower 04
1. Uniform velocity, 2. Simple harmonic motion
(b) A cam with 30 mm as minimum diameter is rotating clockwise as a uniform speed of 1200 rpm and has to give the motion to the roller follower 10 mm diameter as defined below: 10
1. Outward stroke of 25 mm during 120° of cam rotation with equal uniform acceleration and retardation
2. Dwell for 60° cam rotation
3. Return to its initial position during 90° of cam rotation with equal uniform acceleration and retardation
4. Dwell for the remaining 90° cam rotation
Layout the cam profile when the roller axis is offset to right by 5 mm.
- OR
- Q.4 (a) State the relation for Displacement, Velocity and Acceleration for following motion of follower 04
1. Uniform acceleration and retardation
2. Cycloidal motion
(b) A cam with 25 mm as minimum diameter is rotating clockwise as a uniform speed of 500 rpm and has to give the motion to the flat faced follower defined below: 10
1. Outward stroke of 20 mm during 120° of cam rotation with simple harmonic motion
2. Dwell for 30° cam rotation
3. Return to its initial position during 120° of cam rotation with equal uniform acceleration and retardation
4. Dwell for the remaining 90° cam rotation
5. Layout the cam for the above mentioned motion of follower.
- Q.5 (a) Derive the empirical relation for minimum number of teeth to avoid 05

interference in gears.

- (b) If the number of teeth in the gears 1 and 2 are 60 and 40, the module pitch = 3 mm, the pressure angle 20° and the addendum = 0.318 of circular pitch determine the velocity of sliding when the contact is at the tip of the tooth of gear 2 and the gear 2 rotates at 800 rpm.

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OR

- Q.5 (a) Determine the velocity ratio of differential gear box.

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- (b) Figure shows epicyclic gear train. Gear A is fixed to a frame and is therefore stationary. The arm B and gears C and D are free to rotate on the shaft. Gears A, C and D have 100, 101 and 99 teeth respectively. Pitch circle diameters of all are 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.

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