

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III (New) EXAMINATION – WINTER 2019

Subject Code: 2131906

Date: 5/12/2019

Subject Name: Kinematics of Machines

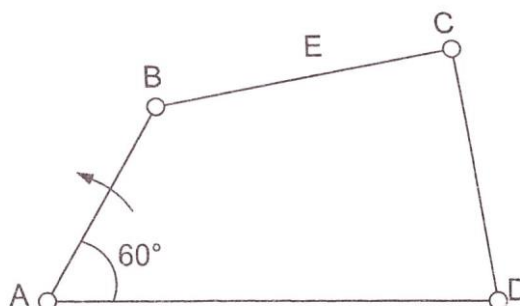
Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

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

- | | MARKS |
|--|-----------|
| Q.1 (a) Define the following terms: Kinematics, Kinematics Chain, and Kinematics Mechanism. | 03 |
| (b) Classify the kinematics pairs. | 04 |
| (c) Explain inversion of four bar mechanism with the help of examples. | 07 |
| Q.2 (a) Explain the types of instantaneous centers. | 03 |
| (b) Explain coriolis component of acceleration. | 04 |
| (c) In Fig a four-link mechanism is shown. The dimensions of various links are; AB = 50 mm, BC=66 mm, CD= 56 mm and AD=100 mm. Determine (i) velocity of the point C (ii) Velocity of the point E on the link BC, if BE = 40 mm, (iii) Angular Velocity of the link BC and CD, (iv) Rubbing velocity of pins A, B, C and D when the radii of the pins are 30, 40, 25, and 35 mm respectively.
At the instant angle DAB = 60°, the link AB has an angular velocity of 10.5 rad/s and rotates in counter-clockwise direction. | 07 |



OR

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|--|-----------|
| (c) PQRS is a four bar chain with links PS fixed. The lengths of the links are PQ = 62.5 mm; QR = 175 mm; RS = 112.5 mm; and PS = 200 mm. The crank PQ rotates at 10 rad/s clockwise. Draw the velocity and acceleration diagram when angle QPS = 60° and Q and R lies on the same side of PS. Find the angular velocity and acceleration of link QR and RS. | 07 |
| Q.3 (a) What is a straight line motion mechanism? Give its classification. | 03 |
| (b) With a neat sketch of Hart's Mechanism prove that it Produces an exact straight line motion. | 04 |
| (c) Show Davis's steering gear mechanism and derive equation for it. | 07 |
| OR | |
| Q.3 (a) Define synthesis. | 03 |
| (b) Explain function generation, path generation and motion generation. | 04 |

- (c) State chebychev theorem and find three precision points for the function $f(x) = x^{1.2}$ in the interval $0 \leq x \leq 6$. $\theta_1 = 60^\circ$, $\Delta\theta = 90^\circ$, $\Phi = 50^\circ$, $\Delta\Phi = 100^\circ$. 07
- Q.4** (a) Define: Module, Tooth thickness, Backlash. 03
 (b) What do you mean by interference in gear? 04
 (c) Derive the equation for finding the length of path of contact for pair of involute gear. 07

OR

- Q.4** (a) Give the three applications of gear trains. 03
 (b) Explain compound gear train with a neat sketch. 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 gear 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 rpm clockwise. 07
- Q.5** (a) Define cam and follower. 03
 (b) Explain types of cam with sketches. 04
 (c) Draw the cam profile for a disc cam and knife edge follower from the following data for one revolution of cam. 07
- (i) Angle of rise = 60°
 - (ii) Follower lift = 40 mm with uniform velocity
 - (iii) Angle of dwell (at rise) = 30°
 - (iv) Angle of fall = 60° where follower moves with uniform velocity.
 - (v) For remaining period of 210° , the follower remains in same position
 - (vi) Diameter of base circle of cam = 50 mm

OR

- Q.5** (a) Define terms related to cam: Pitch circle, Pressure angle, Stroke of the follower. 03
 (b) Classify the followers. 04
 (c) A flat face follower is moved with S. H. M. by a disc cam. Follower rises for 30 mm during the cam rotation of 120° , remains in the same position during 30° of the cam rotation; follower returns to original position during further 120° of rotation of cam and then for last 90° of rotation follower remain stationary. Minimum radius of cam is 25 mm and the diameter of the circular flat face follower is 25 mm. Draw the cam profile. 07
