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B.TECH.

THEORY EXAMINATION (SEM–VIII) 2016-17 ADVANCE SYNTHESIS OF MECHANISMS

Time : 3 Hours

Max. Marks : 100

 $10 \ge 2 = 20$

 $5 \ge 10 = 50$

Note: Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION – A

1. Attempt the following:

- (a) What is the degree of freedom?
- (b) Explain the transmission angle.
- (c) Define the term dimensional synthesis.
- (d) Write down the equation for coupler curve.
- (e) Write the short notes on chebyshev spacing of accuracy points.
- (f) What is the coupler curve?
- (g) What is the mechanical error in linkage?
- (h) What is the approximate mechanism?
- (i) Write the Freudenstein's equation for velocity analysis.
- (j) Explain exact straight line mechanism.

SECTION – B

2. Attempt any five of the following questions:

- (a) Discuss the procedure of five accuracy point's synthesis of crank and follower mechanism.
- (b) Discuss the procedure of designing a four bar function generator with three accuracy points.
- (c) Design a slider crank mechanism in which two successive angular displacements Q_{12} and Q_{23} of the crank produce, respectively two successive linear displacements S_{12} and S_{23} of the follower.
- (d) Explain briefly with the help of neat sketches working and application of one planar and one spatial mechanism.
- (e) Explain with the help of neat sketches cognate linkages and their applications
- (f) Design a four bar linkage to transfer a link AB through three specified positions A_1B_1 , A_2B_2 and A_3B_3 .
- (g) Locate all the instantaneous centres of rotation of the mechanism shown in Fig.



(h) Design a four bar linkage in which two successive clockwise angular displacements of 20° and 30° of the crank produce respectively, two successive angular displacements 10° and 15° of the follower.

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Attempt any two of the following questions:

- 3. Design a slider crank mechanism so that the displacement of the slider is proportional to the square of crank rotation in the interval $45^{\circ} \le \theta \le 135^{\circ}$. Use the three point Chebyshev's spacing.
- 4. Synthesize a four bar linkage that will generate a function $Y = X^{1.5}$, $1 \le X \le 4$. Take three accuracy points. $\theta_0 = 30^\circ$, $\varphi_0 = 90^\circ$ and $\Delta \varphi = \Delta \theta = 90^\circ$, where θ_0 and φ_0 respectively represent the initial angular positions of the input and output crank. $\Delta \theta$ and $\Delta \varphi$ are respectively the ranges of angular movements of the input and output crank.
- 5. Explain with the help of neat sketches one approximate and one exact straight line mechanism.

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