



(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 140854**

Roll No.

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**B. Tech.**

(SEM. VIII) THEORY EXAMINATION, 2014-15  
**ADVANCED SYNTHESIS OF MECHANISM**

Time : 3 Hours]

[Total Marks : 100

**A. Attempt any two parts : (10×2=20)**

1. What do you understand by synthesis of mechanism, discuss its types.
2. What are the difference between approximate and exact straight line mechanism explain with some suitable examples.
3. Discuss the Analysis of mechanical errors in linkage.

**B. Attempt any two parts : (10×2=20)**

1. Using Freudenstein's equation derive equation for :
  - (a) Displacement analysis
  - (b) Velocity analysis
  - (c) Acceleration analysis, for three point and five point position.

2. Write the short notes on Chebyshev spacing of accuracy points.
3. What is coupler curve and generate the equation of coupler curve.

**C. Attempt any two parts : (10×2=20)**

1. The rocker of a crank-rocker linkage is to have a length of 500mm and swing through a total angle of 45° with a ratio of 1.25. Determine a suitable set of dimensions for  $r_1$ ,  $r_2$ , and  $r_3$ .
2. Explain the construction and working of spatial mechanism.
3. Design a 4 bar linkage to generate the function  $y = \log_{10}(x)$  in the interval  $1 \leq x \leq 2$ .

**D. Attempt any two parts : (10×2=20)**

1. Using the overlay method, Chebyshev spacing and six position, design a four bar function generator to solve the equation  $y = x^{1.3}$  for  $0.5 \leq x \leq 1.5$ .
2. Layout a crank rocker mechanism so that output rocker will rotate through 60° and the minimum transmission angle is 40°.
3. What are the various errors in function generation synthesis problem how it will rectify.

**E. Attempt any two parts : (10×2=20)**

1. Synthesize a four bar function generator to solve the equation

$$y = \sin x, \quad 0 \leq x \leq \pi/2$$

use three precision points and Chebyshev spacing. Plot a curve of the actual function and a curve of the actual function which the linkage generates. Compute the max error between them in percent.

Take  $\Delta\Phi = 60^\circ$ ,  $\Delta\Psi = 90^\circ$ ,  $\Phi_0 = 30^\circ$ ,  $\Psi_0 = 60^\circ$ .

2. In a slider crank mechanism, the rotation of the crank from 60° to 150° (CCW) has to be converted into a 20 cm translation of the slider (from left to right) so that the translation is proportional to the rotation of the crank. Design the mechanism, using four Chebyshev's accuracy points.
3. Design a 4 link mechanism if the motion of input and output links are govern by the function  $y = x^{1.5}$  and  $x$  varies from 1 to 4. Assume  $\theta$  to vary from 30° to 120° and  $\phi$  from 60° to 130°. The length of fixed link is 30 mm. Use Chebyshev spacing point.