

Duration: 3 hours

Max Marks: 80

Note: Attempt any 4 questions

Figures to the right indicate full marks

Assume data wherever required and mention it clearly

Drawing sheet are provided to solve graphical method

- Q1 (i)** For the kinematic linkages shown in figure. 1 Calculate the following **15**
1. The no. of binary links
 2. The number of ternary links
 3. The number of total links
 4. The no. of joints or pairs
 5. The No. of Degree of freedom

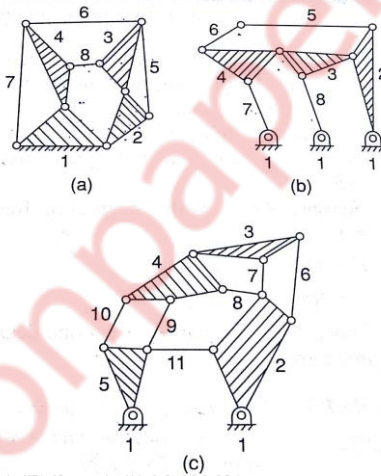


Figure.1

- (ii)** Write short note on Inflection circle and its properties **5**
- Q2 (i)** Design a four bar linkage to meet the following specifications:- **10**
- | Crank | Position | Angular velocity | Angular acceleration |
|--------------|---------------------|--------------------------------|----------------------------------|
| Input | $\theta = 90^\circ$ | $\omega_2 = 3\text{rad/sec}$ | $\alpha_2 = 0 \text{ rad/sec}^2$ |
| Output | $\phi = 90^\circ$ | $\omega_4 = 1.5\text{rad/sec}$ | $\alpha_4 = 1\text{rad/sec}^2$ |
- (ii)** Explain usefulness of double points with suitable examples **10**
- Q3 (i)** Design Four Bar Linkage to meet the following requirements **10**
- | Input Crank | | Output Crank |
|-------------|-----|--------------|
| 50° | 70° | 45° |
| 70° | 90° | 75° |
| 90° | | 120° |
- (ii)** Derive two point coupler curvature equation **10**

Q4 Synthesize the aligned slider crank mechanism satisfying the following conditions Solve **20**
Graphically 3 points method:-

Input crank rotation	Slider motion
$\phi_{12} = 30^\circ$	$S_{12} = 78mm$
$\phi_{13} = 74^\circ$	$S_{13} = 112mm$
$\phi_{14} = 88^\circ$	$S_{14} = 168mm$

Q5 (i) Design a four bar linkage to generate the function $y = x^{5/2}$ for the range of $x=2$ to $x=6$. The input and the output sectors of angles are 60° and 90° respectively. Determine angle co-ordination. Take three accuracy points. **10**

Q6 Write short notes on (Any Two)

(i) Explain the procedure to get approximate dwell linkages using four accuracy points with suitable sketches **10**

(ii) Write short notes on **10**

- a. Synthesis of a mechanism
- b. Properties of a pole triangle

(iii) Explain the following **10**

- (i). Classification of Mechanisms
- (ii). Equivalent mechanisms