

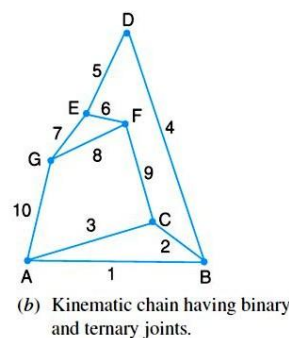
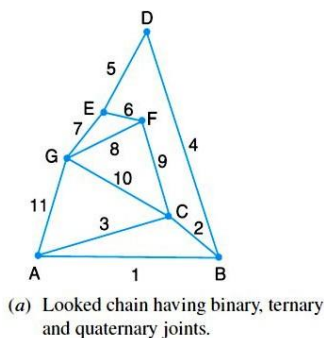
**Lukhdhirji Engineering College, Morbi**  
**Department of Mechanical Engineering**

**Subject:** Kinematics & Theory of Machines (BE04000171)  
**Year :** 2025-26

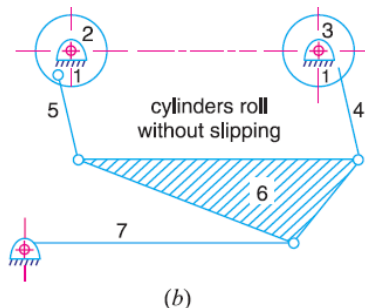
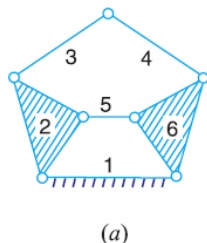
**Semester :** 4<sup>th</sup>

**Assignment 1: Introduction (CO1 )**

1. Explain the term kinematic link. Give the classification of kinematic link.
2. What is a machine? Giving example, differentiate between a machine and a structure
3. Write notes on complete and incomplete constraints in lower and higher pairs, illustrating your answer with neat sketches.
4. Explain different kinds of kinematic pairs giving example for each one of them.
5. Explain the terms: 1. Lower pair, 2. Higher pair, 3. Kinematic chain, and 4. Inversion.
6. In what way a mechanism differs from a machine?
7. What is the significance of degrees of freedom of a kinematic chain when it functions as a mechanism? Give examples.
8. Check following is kinematic chain or not.



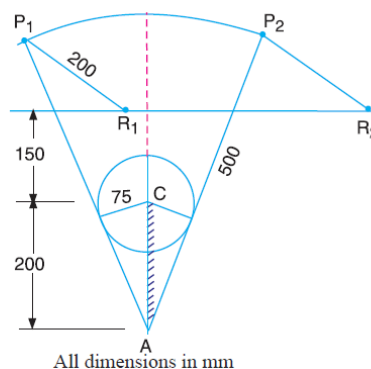
9. Determine the Degree of Freedom for following



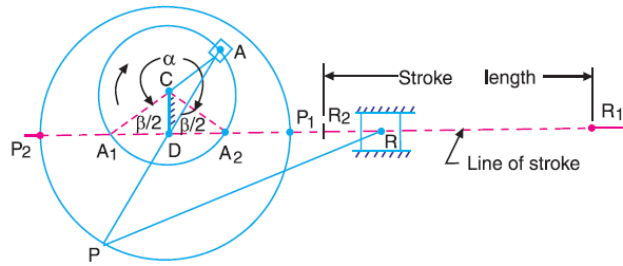
10. Explain Grubler's criterion for determining degree of freedom for mechanisms. Using Grubler's criterion for plane mechanism, prove that the minimum number of binary links in a constrained mechanism

with simple hinges is four.

11. Sketch and explain the various inversions of a slider crank chain.
12. Show that slider crank mechanism is a modification of the basic four bar mechanism
13. Sketch slider crank chain and its various inversions, stating actual machines in which these are used in practice.
14. Sketch and describe the working of two different types of quick return mechanisms. Give examples of their applications. Derive an expression for the ratio of times taken in forward and return stroke for one of these mechanisms.
15. Sketch and explain any two inversions of a double slider crank chain.
16. Identify the kinematic chains to which the following mechanisms belong :
  1. Steam engine mechanism ; 2. Beam engine ; 3. Whitworth quick return motion mechanism; 4. Elliptical trammels.
17. In a crank and slotted lever quick return mechanism, the distance between the fixed centres is 150 mm and the driving crank is 75 mm long. Determine the ratio of the time taken on the cutting and return strokes.
18. In a crank and slotted lever quick return motion mechanism, the distance between the fixed centres  $O$  and  $C$  is 200 mm. The driving crank  $CP$  is 75 mm long. The pin  $Q$  on the slotted lever, 360 mm from the fulcrum  $O$ , is connected by a link  $QR$  100 mm long, to a pin  $R$  on the ram. The line of stroke of  $R$  is perpendicular to  $OC$  and intersects  $OC$  produced at a point 150 mm from  $C$ . Determine the ratio of times taken on the cutting and return strokes.
19. In a crank and slotted lever quick return mechanism, as shown in Fig. 5.37, the driving crank length is 75 mm. The distance between the fixed centres is 200 mm and the length of the slotted lever is 500 mm. Find the ratio of the times taken on the cutting and idle strokes. Determine the effective stroke also.



20. The Whitworth quick return motion mechanism has the driving crank 150 mm long. The distance between fixed centres is 100 mm. The line of stroke of the ram passes through the centre of rotation of the slotted lever whose free end is connected to the ram by a connecting link. Find the ratio of time of cutting to time of return.
21. A Whitworth quick return motion mechanism, as shown in Fig. has the following particulars :



Length of stroke = 150 mm ; Driving crank length = 40 mm;  
 Time of cutting stroke/ Time of returnstroke = 2  
 Find the lengths of  $CD$  and  $PD$ . Also determine the angles  $\alpha$  and  $\beta$   
**[Hint : Length of stroke =  $R_1R_2 = P_1P_2 = 2PD$ ]**