

# 2. Kinematic Analysis

## Multiloop Mechanisms

1. Disconnect gear pairs (if any) and write the gear relations.

No gears!

2. Disconnect as many **revolute joints** as necessary to eliminate **all** loops. (However no link should be totally disconnected!)

Let's disconnect D and E (selection is totally arbitrary, you could as well select (B and C) or (B and E) or (D and C) or (A and C) or (A and E) etc. however in all cases the number of joints to be disconnected is **2** as predicted by Euler's polyhedron formula:  $L = j - \ell + 1 = 7 - 6 + 1 = 2$ )

Please note that disconnecting B and D is not allowed since link 6 becomes totally disconnected. Similarly disconnecting C and E will make link 4 totally disconnected therefore not allowed!

3. By reconnecting **only one joint at a time** (all others should be disconnected during this process) write the loop formed by connecting this joint.

Reconnect D (**E** is disconnected!)

$$\overrightarrow{A_0A} + \overrightarrow{AB} + \overrightarrow{BD_6} = \overrightarrow{A_0D_0} + \overrightarrow{D_0D_5}$$

Reconnect **E** (D is disconnected!)

$$\overrightarrow{A_0A} + \overrightarrow{AC} + \overrightarrow{CE_4} = \overrightarrow{A_0D_0} + \overrightarrow{D_0E_5}$$

Two possible independent loop closure equations.

