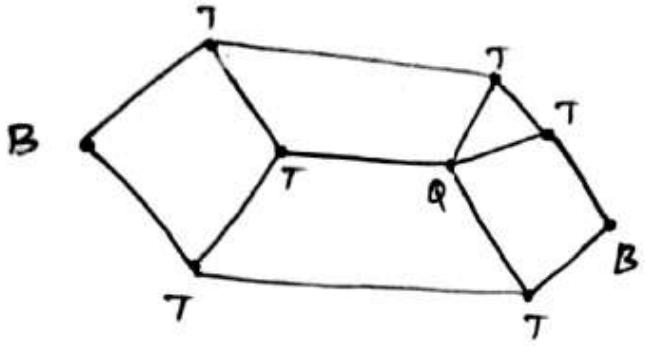


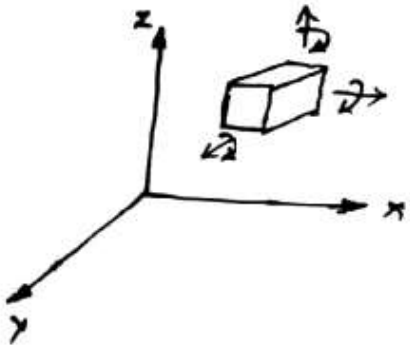
B- Binary link

T- Ternary link

Q- Quaternary link

Degrees of Freedom:

It can be defined as the number of independent relative motions, both translational & rotational, a pair have.



6- D.O.F

Redundant chain does not allow any motion of a link relative to other.

A linkage is obtained if one of the links of a kinematic chain is fixed.

If one of the links of a redundant chain is fixed, it is known as structure or locked system

The d.o.f of a locked system is zero

A structure with negative d.o.f is known as a super structure

Kutzbach criterion:

A mechanism with l number of links connected by j number of joints or lower pair or binary joints and h numbers of higher pair, then the number of d.o.f of mechanism is given by

$$n = 3(l-1) - 2j - h$$

n = No. of d.o.f
l = links
J = Joints
h = Higher pair.

This equation is called kutzbach criterion for the movability of a mechanism having plane motion.

Grubler's Criterion:

Grubler's criterion applies to mechanisms with only single d.o.f joints where the overall movability of the mechanism is unity.

Substituting $n=1$ & $h=0$ in kutzbach criterion then

$$1 = 3(l-1) - 2j \quad (or) \quad 3l - 2j - 4 = 0$$

This equation is known as Grubler's criterion for the plane mechanisms with constrained motion.