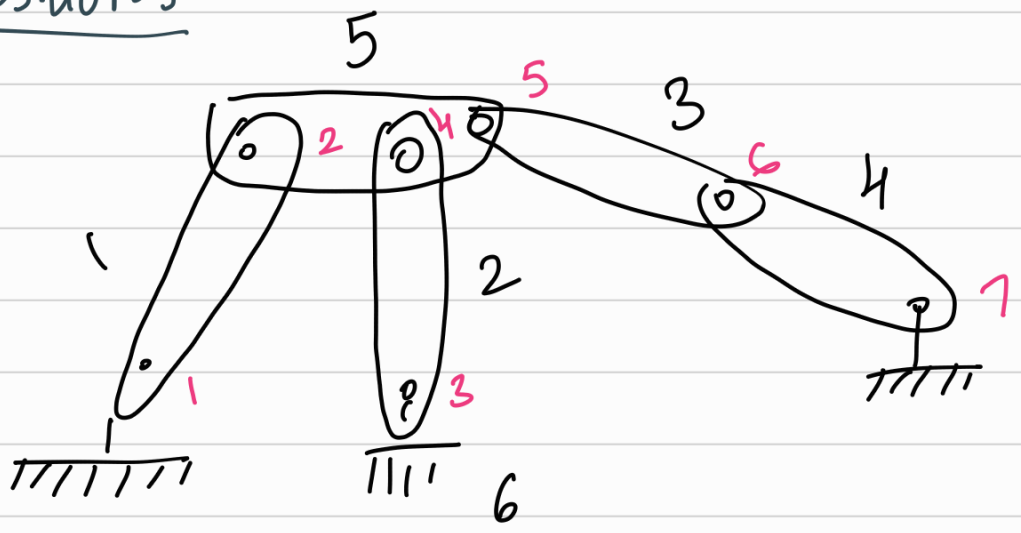
Questions

1.



$N = 6$

$J = 7$

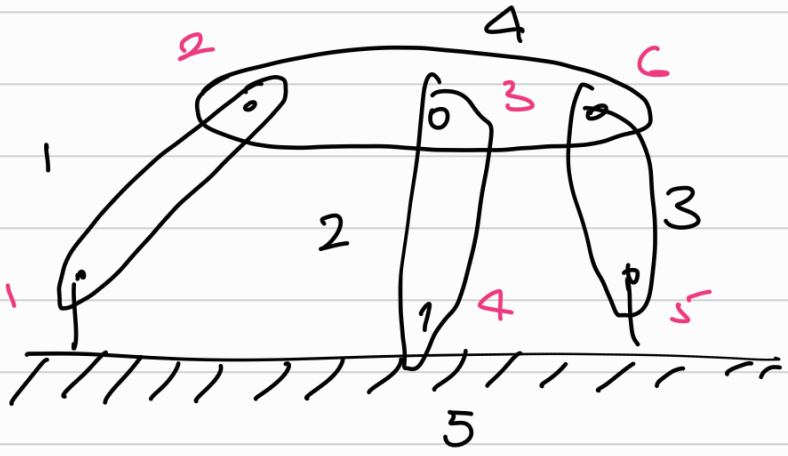
$$DOF = k(N-J-1) + \sum_{i=1}^{J} f_i$$

$$= 3(6-7-1) + 7\times 1$$

$$= -6 + 7$$

$$= 1$$

2.



$N = 5$

$J = 6$

$$DoF = 3(5-6-1) + 6$$

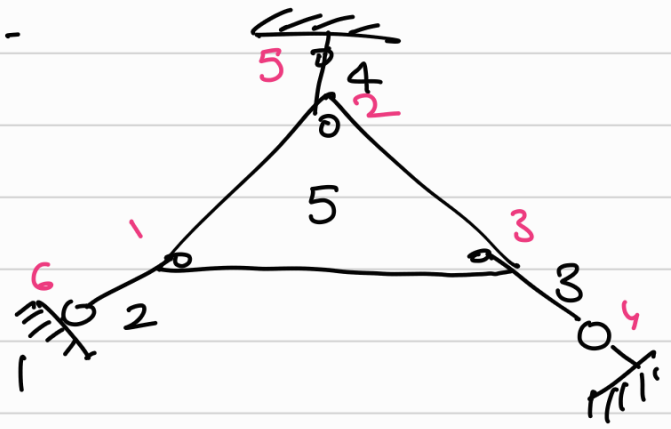
$$= -6 + 6$$

$$= 0$$

It says DoF = 0 but this obviously isn't true.

- The Wembler's formula doesn't exactly tell us the DoF but gives us the lower bound for the DoF instead. [doesn't take geometry into account]

Eg -



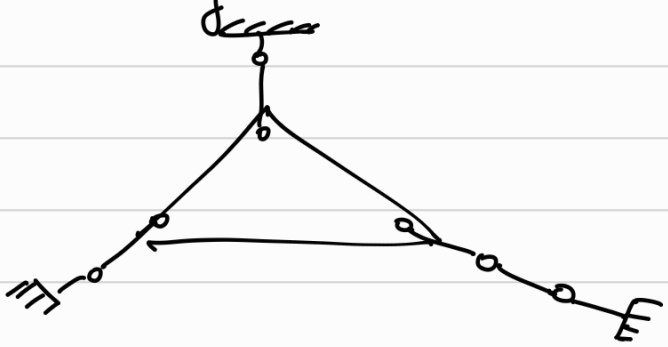
$N = 5$

$J = 6$

$k = 3$ (planar)

$$DoF = 3(5 - 6 - 1) + 6 \times 1$$
$$= -6 + 6$$
$$= 0$$

→ we can increase the degree of freedom by adding an extra link & joint.



$N = 6$

$J = 7$

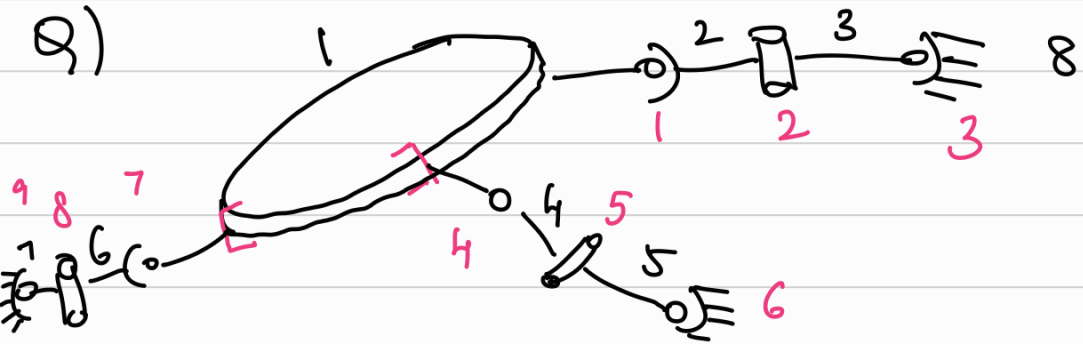
$DoF = 3(6 - 7 - 1) + 7$

$= 1$.

★

FIND CASES WHERE THE FORMULA FAILS

Q)



8 → ground

1 → object

here, ○≡ → spherical

▯ → revolute

N = 8, k = 6 (non-planar), J = 9

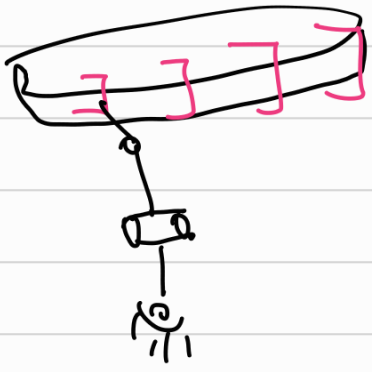
DoF = 6(8 − 9 − 1) + 3(1) + 6(3)

↳ revolute ↳ spherical

= −12 + 18 + 3

= 9

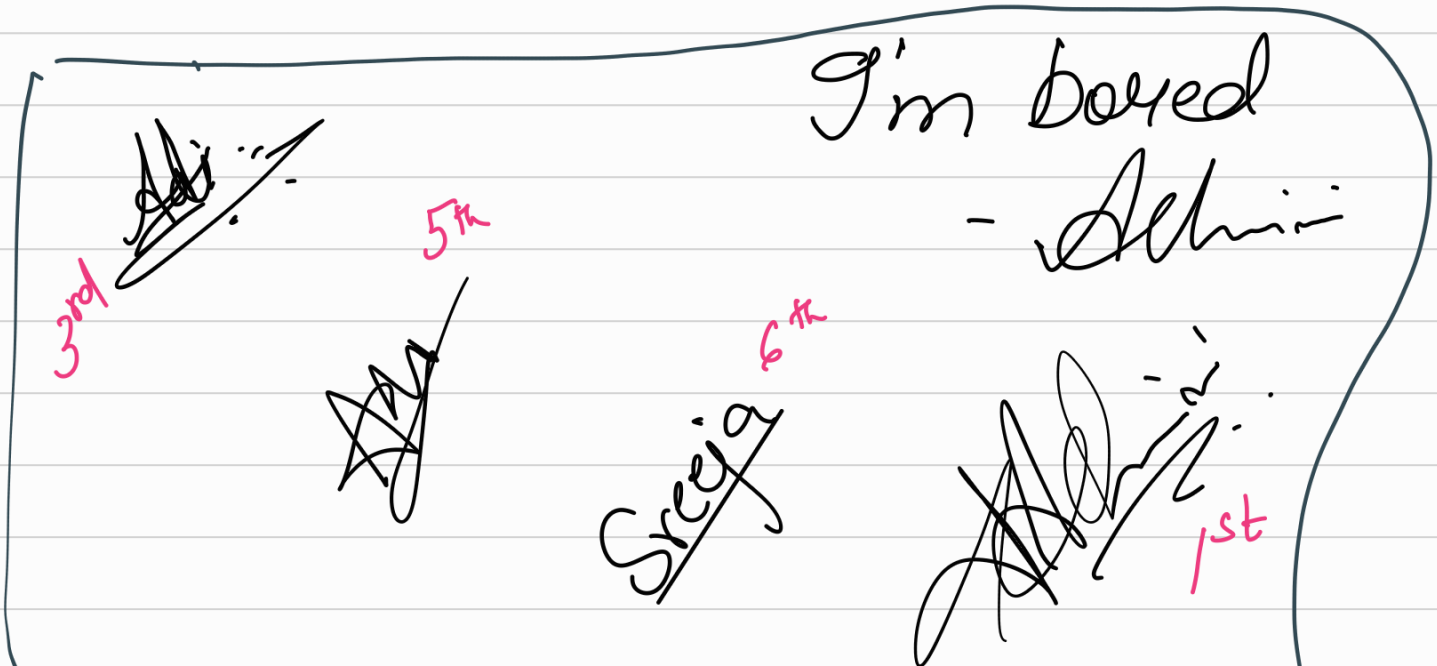
- now assume there are n-clamps on the spherical disk



DoF = 6(2n − 3n − 1 + 2) + 2n(3) + n

= −6n + 6 + 6n + n

= n + 6



Assignment + Quiz → 2 parameterization questions, DoF, task space & work space

Q) difference b/w explicit & implicit parameterization.