

$00:0$   
 $00:0$   
 from 1 to 90  
 from 1 to 90  
 from 1 to 90

$67$   
 $182250$

$$\Delta x \Delta \theta = J_a \Delta \theta$$

$$+ J_a \Delta \theta = 0$$

$$K \Delta \theta$$

$$\begin{aligned}
 &K_1 \Delta \theta_1 + g_1 \Delta \theta_1 = 0 \\
 &K_2 \Delta \theta_2 + g_2 \Delta \theta_2 = 0 \\
 &K_3 \Delta \theta_3 + g_3 \Delta \theta_3 = 0
 \end{aligned}$$

$$\theta \in [0, 70]$$

$$\theta_2 \in [0, 45]$$

$$\theta_3 \in [0, 45]$$

$$90 \times 60 \times 60$$

$$3240000$$

182250

$$g_0 \Delta \theta_2 = g_1$$

$k_1 \quad k_2 \quad k_3$



$$K_1 \phi_1 + \lambda_1 T = 0$$

$$K_2 \phi_2 + \lambda_2 T = 0$$

$$K_3 \phi_3 + \lambda_3 T = 0$$

$$\lambda_a \Delta \phi_a - (\lambda_1 \phi_1 + \lambda_2 \phi_2 + \lambda_3 \phi_3) = 0$$

~~Wiederholung~~

$$\begin{bmatrix} K_1 & 0 & 0 \\ 0 & K_2 & 0 \\ 0 & 0 & K_3 \\ -\lambda_1 & -\lambda_2 & -\lambda_3 \end{bmatrix} \begin{bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \end{bmatrix} + \begin{bmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_3 \end{bmatrix} T + \lambda_a \Delta \phi_a = 0$$

4x3                      4x1                      1x1

$$\begin{aligned} \phi_1: & K_1 \phi_1 + 0 K_2 + 0 K_3 + \lambda_1 T - 0 \Delta \phi_a = -K_1 \phi_1 \\ \phi_2: & 0 K_1 + K_2 \phi_2 + 0 K_3 + \lambda_2 T + 0 \Delta \phi_a = 0 \\ \phi_3: & 0 K_1 + 0 K_2 + K_3 \phi_3 + \lambda_3 T - 0 \Delta \phi_a = 0 \end{aligned}$$

$$0 K_1 + 0 K_2 + 0 K_3 + 0 T + \lambda_a \Delta \phi_a = \lambda_1 \phi_1 + \lambda_2 \phi_2 + \lambda_3 \phi_3$$

$$\begin{bmatrix} 0 & 0 & R_1 & 0 \\ 0 & 0 & R_2 & 0 \\ 0 & 0 & R_3 & 0 \\ 0 & 0 & 0 & R_a \end{bmatrix} \begin{bmatrix} K_2 \\ K_3 \\ T \\ \Delta \phi_a \end{bmatrix} = \begin{bmatrix} -K_1 \phi_1 \\ 0 \\ 0 \\ R_1 \phi_1 + R_2 \phi_2 + R_3 \phi_3 \end{bmatrix}$$

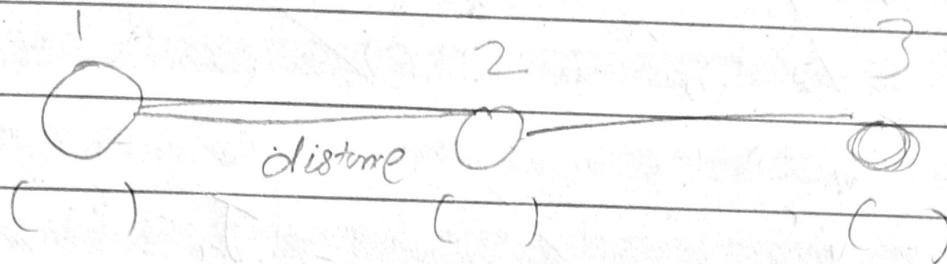
A - X b

~~K\_1 \phi\_1~~

~~T~~

~~K\_3 \phi\_3~~

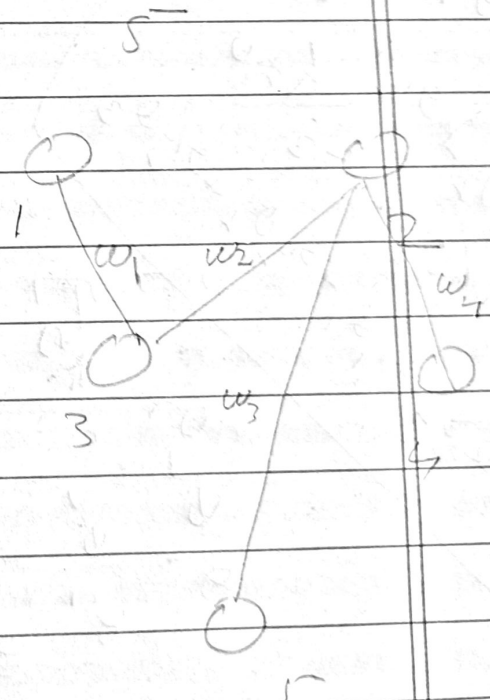
~~K\_2 \phi\_2~~



$$x_3, y_3 = 1, 0, 1$$

- Each row will be a node of graph
- Nodes will be connected if either stiffness or Tension is same.
- weight will be distance between the end points of the configuration.

	1	2	3	4	5
1	$\infty$	$\infty$	$w_1$	$\infty$	$\infty$
2	$\infty$	$\infty$	$w_2$	$w_4$	$w_3$
3	$w_1$	$w_2$	$\infty$	$\infty$	$\infty$
4	$\infty$	$w_4$	$\infty$	$\infty$	$\infty$
5	$\infty$	$w_3$	$\infty$	$\infty$	$\infty$



$$182k \times 182k$$