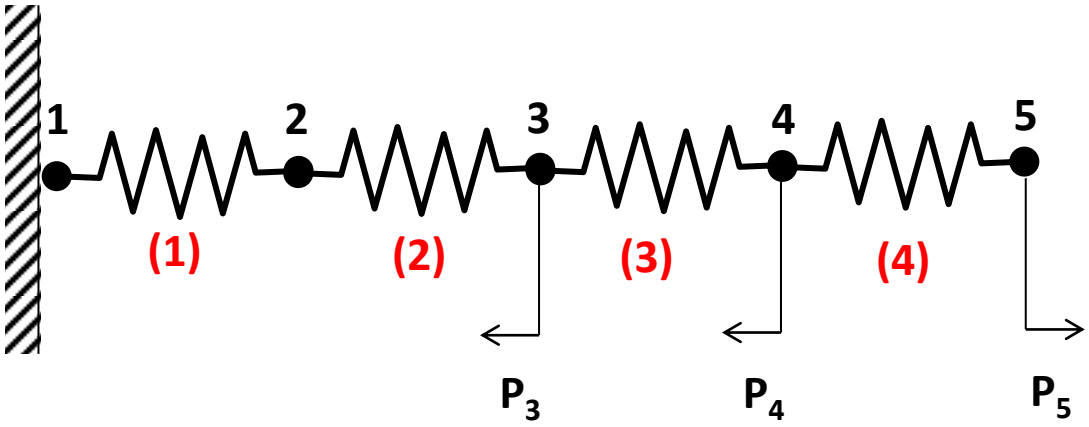
Problem 01:

To assemble global stiffness matrix for total system



Applied Load

$P_1 = 0$ N
$P_2 = 0$ N
$P_3 = -20$ N
$P_4 = -30$ N
$P_5 = 30$ N

(.) - Spring element number

Problem 02:

Simultaneous linear non-homogeneous equation:

$$\begin{bmatrix} 5.5 & -4.6 & 0 & 0 & 0 \\ -4.6 & 14 & -4.6 & 0 & 0 \\ 0.4 & -4.6 & 11 & -4.6 & 0.4 \\ 0 & 0 & -4.6 & 14.2 & -4.6 \\ 0 & 0 & 4 & -4.6 & 6.5 \end{bmatrix} \begin{Bmatrix} U_1 \\ U_2 \\ U_3 \\ U_4 \\ U_5 \end{Bmatrix} = \begin{Bmatrix} 50 \\ 200 \\ 100 \\ 200 \\ 90 \end{Bmatrix}$$

Constraints:

U_1=15 and U_5=4

Procedure for problem no. 2

Step 1: If it is given U_i and U_j values based on boundary conditions, then first step is to set row i = 0 and row j = 0 of the $[K]$ matrix except the values $K_{i,i}$ and $K_{j,j}$.

Replace constant column matrix element F_i by $K_{i,i} * U_i$ and also replace constant column matrix element F_j by $K_{j,j} * U_j$.

Step 2: Set column i and column j elements of $[K]$ matrix equal to zero (except $K_{i,i}$ and $K_{j,j}$ after replacing $F(:,1)$ such that $F(:,1) = F(:,1) - K(:,i)*U_i - K(:,j)*U_j$ except $F(i,1)$ and $F(j,1)$.

$$\begin{bmatrix} 5.5 & -4.6 & 0 & 0 & 0 \\ -4.6 & 14 & -4.6 & 0 & 0 \\ 0.4 & -4.6 & 11 & -4.6 & 0.4 \\ 0 & 0 & -4.6 & 14.2 & -4.6 \\ 0 & 0 & 4 & -4.6 & 6.5 \end{bmatrix} \begin{Bmatrix} U_1 \\ U_2 \\ U_3 \\ U_4 \\ U_5 \end{Bmatrix} = \begin{Bmatrix} 50 \\ 200 \\ 100 \\ 200 \\ 90 \end{Bmatrix}$$