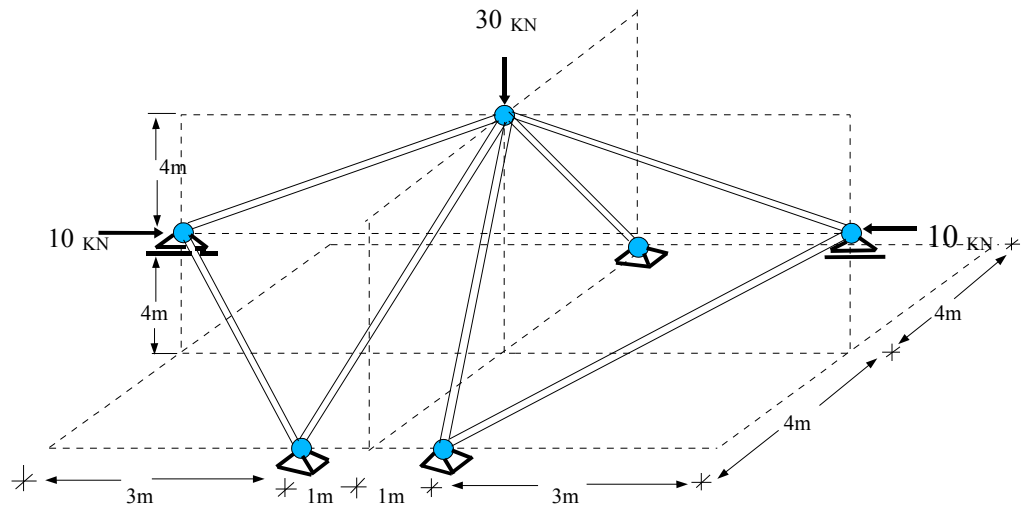


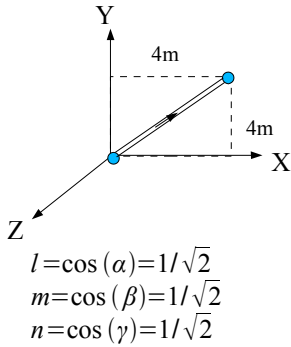
$$\sum_{i=1}^7 E_i = 2 \times 10^7 \text{ Kn/m}^2$$

$$\sum_{i=1}^7 A_i = 0.05 m^2$$



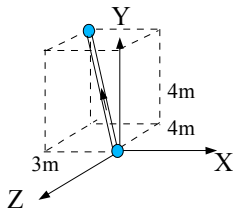
<i>Element No</i>	<i>X(i) m.</i>	<i>Y(i)</i>	<i>Z(i)</i>	<i>X(j)</i>	<i>Y(j)</i>	<i>Z(j)</i>	<i>Modal displacements</i>	
I	0.00	4.00	0.00	4.00	8.00	0.00	1-0-0	2-3-4
II	3.00	0.00	4.00	0.00	4.00	0.00	0-0-0	1-0-0
III	3.00	0.00	4.00	4.00	8.00	0.00	0-0-0	2-3-4
IV	8.00	4.00	0.00	4.00	8.00	0.00	5-0-0	2-3-4
V	5.00	0.00	4.00	4.00	8.00	0.00	0-0-0	2-3-4
VI	5.00	0.00	4.00	8.00	4.00	0.00	0-0-0	5-0-0
VII	4.00	8.00	0.00	4.00	0.00	-4.00	2-3-4	0-0-0

I. element's transformation matrix



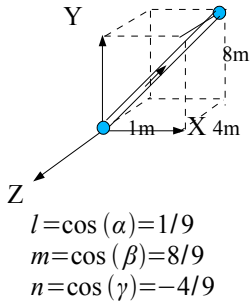
$$[T]_I = \begin{bmatrix} 1/\sqrt{2} & 1/\sqrt{2} & 0.00 & 0.00 & 0.00 & 0.00 \\ -1/\sqrt{2} & 1/\sqrt{2} & 0.00 & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 1/\sqrt{2} & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & 1/\sqrt{2} & 1/\sqrt{2} & 0.00 \\ 0.00 & 0.00 & 0.00 & -1/\sqrt{2} & 1/\sqrt{2} & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \end{bmatrix}_{6 \times 6}$$

II. element's transformation matrix



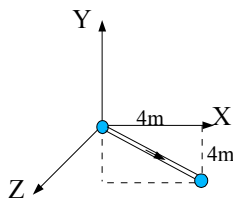
$$[T]_{II} = \begin{bmatrix} -3/\sqrt{41} & 4/\sqrt{41} & -4/\sqrt{41} & 0.00 & 0.00 & 0.00 \\ -4/\sqrt{41} & -3/\sqrt{41} & 0.00 & 0.00 & 0.00 & 0.00 \\ 4/\sqrt{41} & 0.00 & -3/\sqrt{41} & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & -3/\sqrt{41} & 4/\sqrt{41} & -4/\sqrt{41} \\ 0.00 & 0.00 & 0.00 & -4/\sqrt{41} & -3/\sqrt{41} & 0.00 \\ 0.00 & 0.00 & 0.00 & 4/\sqrt{41} & 0.00 & -3/\sqrt{41} \end{bmatrix}_{6 \times 6}$$

III. element's transformation matrix



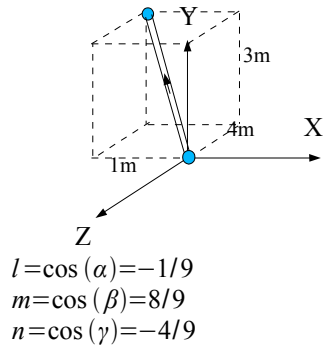
$$[T]_{III} = \begin{bmatrix} 1/9 & 8/9 & -4/9 & 0.00 & 0.00 & 0.00 \\ -8/9 & 1/9 & 0.00 & 0.00 & 0.00 & 0.00 \\ 4/9 & 0.00 & 1/9 & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & 1/9 & 8/9 & -4/9 \\ 0.00 & 0.00 & 0.00 & -8/9 & 1/9 & 0.00 \\ 0.00 & 0.00 & 0.00 & 4/9 & 0.00 & 1/9 \end{bmatrix}_{6 \times 6}$$

IV. element's transformation matrix



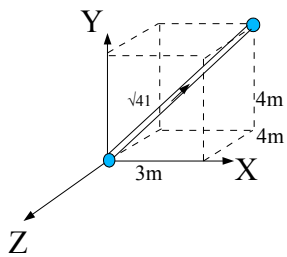
$$[T]_{IV} = \begin{bmatrix} 1/\sqrt{2} & -1/\sqrt{2} & 0.00 & 0.00 & 0.00 & 0.00 \\ 1/\sqrt{2} & 1/\sqrt{2} & 0.00 & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 1/\sqrt{2} & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & 1/\sqrt{2} & -1/\sqrt{2} & 0.00 \\ 0.00 & 0.00 & 0.00 & 1/\sqrt{2} & 1/\sqrt{2} & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 1/\sqrt{2} \end{bmatrix}_{6 \times 6}$$

V. element's transformation matrix



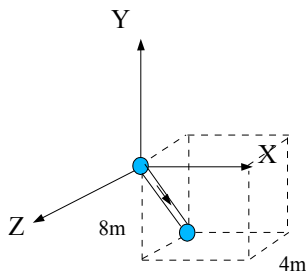
$$[T]_V = \begin{bmatrix} -1/9 & 8/9 & -4/9 & 0.00 & 0.00 & 0.00 \\ -8/9 & -1/9 & 0.00 & 0.00 & 0.00 & 0.00 \\ 4/9 & 0.00 & -1/9 & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & -1/9 & 8/9 & -4/9 \\ 0.00 & 0.00 & 0.00 & -8/9 & -1/9 & 0.00 \\ 0.00 & 0.00 & 0.00 & 4/9 & 0.00 & -1/9 \end{bmatrix}_{6 \times 6}$$

VI. element's transformation matrix



$$[T]_{VI} = \begin{bmatrix} 3/\sqrt{41} & 4/\sqrt{41} & -4/\sqrt{41} & 0.00 & 0.00 & 0.00 \\ -4/\sqrt{41} & 3/\sqrt{41} & 0.00 & 0.00 & 0.00 & 0.00 \\ 4/\sqrt{41} & 0.00 & 3/\sqrt{41} & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & 3/\sqrt{41} & 4/\sqrt{41} & -4/\sqrt{41} \\ 0.00 & 0.00 & 0.00 & -4/\sqrt{41} & 3/\sqrt{41} & 0.00 \\ 0.00 & 0.00 & 0.00 & 4/\sqrt{41} & 0.00 & 3/\sqrt{41} \end{bmatrix}_{6 \times 6}$$

VII. element's transformation matrix



$$[T]_{VII} = \begin{bmatrix} 0.00 & -2/\sqrt{5} & -1/\sqrt{5} & 0.00 & 0.00 & 0.00 \\ 1/\sqrt{2} & 1/\sqrt{2} & 0.00 & 0.00 & 0.00 & 0.00 \\ 1/\sqrt{5} & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & -2/\sqrt{5} & 0.00 \\ 0.00 & 0.00 & 0.00 & 2/\sqrt{5} & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & 1/\sqrt{5} & 0.00 & 0.00 \end{bmatrix}_{6 \times 6}$$

I. element's global axis stiffness matrix

$$[K]_I = \begin{bmatrix} 1 & 0 & 0 & 2 & 3 & 4 \\ 1/2 & 1/2 & 0.00 & -1/2 & -1/2 & 0.00 \\ 1/2 & 1/2 & 0.00 & -1/2 & -1/2 & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \\ -1/2 & -1/2 & 0.00 & 1/2 & 1/2 & 0.00 \\ -1/2 & -1/2 & 0.00 & 1/2 & 1/2 & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \end{bmatrix}_{6 \times 6} \quad \frac{AE}{4\sqrt{2}} \quad \begin{bmatrix} 1 \\ 0 \\ 0 \\ 2 \\ 3 \\ 4 \end{bmatrix}$$

II. element's global axis stiffness matrix

$$[K]_{II} = \begin{bmatrix} 0 & 0 & 0 & 1 & 0 & 0 \\ 9/41 & -12/41 & 12/41 & -9/41 & 12/41 & -12/41 \\ -12/41 & 16/41 & -16/41 & 12/41 & -16/41 & 16/41 \\ 12/41 & -16/41 & 16/41 & -12/41 & 16/41 & -16/41 \\ -9/41 & 12/41 & -12/41 & 9/41 & -12/41 & 12/41 \\ 12/41 & -16/41 & 16/41 & -12/41 & 16/41 & -16/41 \\ -12/41 & 16/41 & -16/41 & 12/41 & -16/41 & 16/41 \end{bmatrix}_{6 \times 6} \quad \frac{AE}{\sqrt{41}} \quad \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \end{bmatrix}$$

III. element's global axis stiffness matrix

$$[K]_{III} = \begin{bmatrix} 0 & 0 & 0 & 2 & 3 & 4 \\ 1/81 & 8/81 & -4/81 & -1/81 & -8/81 & 4/81 \\ 8/81 & 64/81 & -32/81 & -8/81 & -64/81 & 32/81 \\ -4/81 & -32/81 & 16/81 & 4/81 & 32/81 & -16/81 \\ -1/81 & -8/81 & 4/81 & 1/81 & 8/81 & -4/81 \\ -8/81 & -64/81 & 32/81 & 8/81 & 64/81 & -32/81 \\ 4/81 & 32/81 & -16/81 & -4/81 & -32/81 & 16/81 \end{bmatrix}_{6 \times 6} \quad \frac{AE}{9} \quad \begin{bmatrix} 0 \\ 0 \\ 0 \\ 2 \\ 3 \\ 4 \end{bmatrix}$$

IV. element's global axis stiffness matrix

$$[K]_{IV} = \begin{bmatrix} 5 & 0 & 0 & 2 & 3 & 4 \\ 1/2 & -1/2 & 0.00 & -1/2 & 1/2 & 0.00 \\ -1/2 & 1/2 & 0.00 & 1/2 & -1/2 & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \\ -1/2 & 1/2 & 0.00 & 1/2 & -1/2 & 0.00 \\ 1/2 & -1/2 & 0.00 & -1/2 & 1/2 & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \end{bmatrix}_{6 \times 6} \quad \frac{AE}{4\sqrt{42}} \quad \begin{bmatrix} 5 \\ 0 \\ 0 \\ 2 \\ 3 \\ 4 \end{bmatrix}$$

V. element's global axis stiffness matrix

$$[K]_V = \begin{bmatrix} \mathbf{0} & \mathbf{0} & \mathbf{0} & \mathbf{2} & \mathbf{3} & \mathbf{4} \\ 1/81 & -8/81 & 4/81 & -1/81 & 8/81 & -4/81 \\ -8/81 & 64/81 & -32/81 & 8/81 & -64/81 & 32/81 \\ 4/81 & -32/81 & 16/81 & -4/81 & 32/81 & -16/81 \\ -1/81 & 8/81 & -4/81 & 1/81 & -8/81 & 4/81 \\ 8/81 & -64/81 & 32/81 & -8/81 & 64/81 & -32/81 \\ -4/81 & 32/81 & -16/81 & 4/81 & -32/81 & 16/81 \end{bmatrix} \begin{matrix} 0 \\ 0 \\ 0 \\ 2 \\ 3 \\ 4 \end{matrix} AE/9$$

VI. element's global axis stiffness matrix

$$[K]_{VI} = \begin{bmatrix} \mathbf{0} & \mathbf{0} & \mathbf{0} & \mathbf{5} & \mathbf{0} & \mathbf{0} \\ 9/41 & 12/41 & -12/41 & -9/41 & -12/41 & 12/41 \\ 12/41 & 16/41 & -16/41 & -12/41 & -16/41 & 16/41 \\ -12/41 & -16/41 & 16/41 & 12/41 & 16/41 & -16/41 \\ -9/41 & -12/41 & 12/41 & 9/41 & 12/41 & -12/41 \\ -12/41 & -16/41 & 16/41 & 12/41 & -16/41 & -16/41 \\ 12/41 & 16/41 & -16/41 & -12/41 & -16/41 & 16/41 \end{bmatrix} \begin{matrix} 0 \\ 0 \\ 0 \\ 5 \\ 0 \\ 0 \end{matrix} AE/\sqrt{(41)}$$

VII. element's global axis stiffness matrix

$$[K]_{VII} = \begin{bmatrix} \mathbf{2} & \mathbf{3} & \mathbf{4} & \mathbf{0} & \mathbf{0} & \mathbf{0} \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \\ 0.00 & 4/5 & 2/5 & 0.00 & -4/5 & -2/5 \\ 0.00 & 2/5 & 1/5 & 0.00 & -2/5 & -1/5 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \\ 0.00 & -4/5 & -2/5 & 0.00 & 4/5 & 2/5 \\ 0.00 & -2/5 & -1/5 & 0.00 & 2/5 & 1/5 \end{bmatrix} \begin{matrix} 2 \\ 3 \\ 4 \\ 0 \\ 0 \\ 0 \end{matrix} AE/4\sqrt{45}$$

All system stiffness matrix

$$K_{11} = AE*[1/2*1/4\sqrt{2} + 9/41*1/\sqrt{41}] = 0.12267*AE$$

$$K_{12} = AE*[-1/2*1/4\sqrt{2}] = -0.08838*AE$$

$$K_{13} = AE*[-1/2*1/4\sqrt{2}] = -0.08838*AE$$

$$K_{14} = AE*[0.00] = 0.00$$

$$K_{15} = AE*[0.00] = 0.00$$

$$K_{22} = AE*[1/2*1/4\sqrt{2} + 1/81*1/9 + 1/2*1/4\sqrt{2} + 1/81*1/9 + 0.00] = 0.17952*AE$$

$$K_{23} = AE*[1/2*1/4\sqrt{2} + 8/81*1/9 - 1/2*1/4\sqrt{2} - 8/81*1/9 + 0.00] = 0.00$$

$$K_{24} = AE*[0.00 - 4/81*1/9 + 0.00 + 4/81*1/9 + 0.00] = 0.00$$

$$K_{25} = AE*[-1/2*1/4\sqrt{2}] = -0.08838*AE$$

$$K_{33} = AE * (1/2 * 1/4\sqrt{2} + 64/81 * 1/9 + 1/2 * 1/4\sqrt{2} + 64/81 * 1/8 + 4/5 * 1/4\sqrt{5}) = 0.26869 * AE$$

$$K_{34} = AE * (0.00 - 32/81 * 1/9 + 0.00 - 32/81 * 1/9 + 2/5 * 1/4\sqrt{5}) = -0.043070 * AE$$

$$K_{35} = AE * (1/2 * 1/4\sqrt{2}) * AE$$

$$K_{44} = AE * (0.00 + 16/81 * 1/9 + 0.00 + 16/81 * 1/9 + 1/5 * 1/4\sqrt{5}) = 0.066256$$

$$K_{45} = AE * (0.00) = 0.00$$

$$K_{55} = AE * (1/2 * 1/4\sqrt{2} + 9/41 * 1/\sqrt{41}) = 0.122670$$

All system global displacements:

$$[K]\{D\} = \{P\}$$

1	2	3	4	5
0.122760	-0.088388	-0.088388	0.000	0.000
-0.088388	0.179250	0.000	0.000	-0.088388
-0.088388	0.000	0.441802	-0.04307	0.08838
0.000	0.000	-0.04307	0.066256	0.000
0.000	-0.00388	0.088388	0.000	0.122670

$$_{5 \times 5} \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{bmatrix} * \begin{Bmatrix} D_1 \\ D_2 \\ D_3 \\ D_4 \\ D_5 \end{Bmatrix}_{5 \times 1} = \begin{Bmatrix} 10.00 \\ 0.00 \\ -30.00 \\ 0.00 \\ -10.00 \end{Bmatrix}_{5 \times 1}$$

System displacement:

$$D_1 = +42.30/AE = +42.30/(2 * 10E+7 * 0.05) = 0.4230 E-4 \text{ metre} = 0.042 \text{ mm}$$

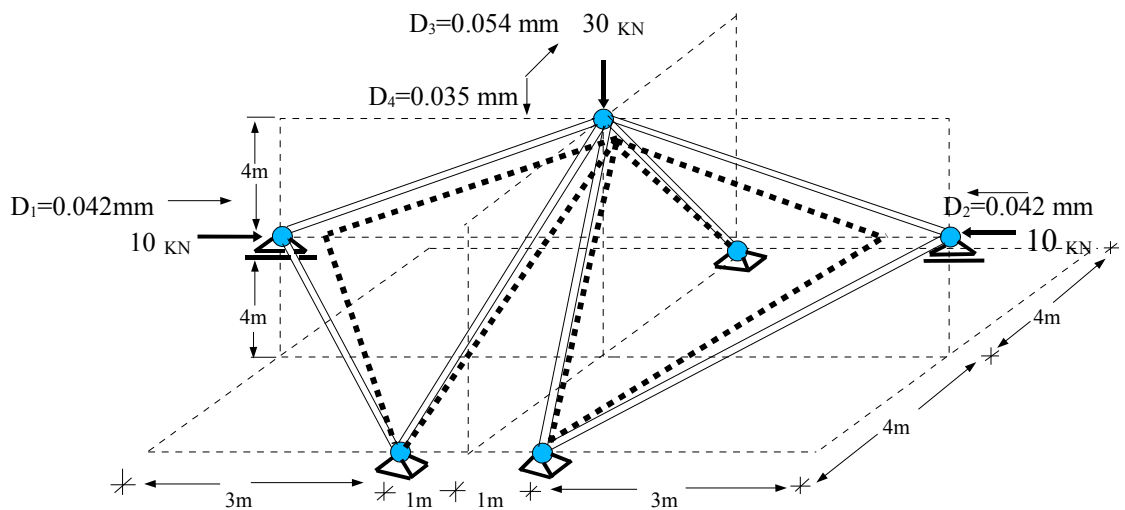
$$D_2 = 0.00$$

$$D_3 = -54.444/AE = -54.444/(2 * 10E+7 * 0.05) = -0.5443E-4 \text{ metre} = -0.054 \text{ mm}$$

$$D_4 = -35.380/AE = -35.380/(2 * 10E+7 * 0.05) = -0.3538E-4 \text{ metre} = -0.035 \text{ mm}$$

$$D_5 = -42.300/AE = -42.300/(2 * 10E+7 * 0.05) = -0.4230E-4 \text{ metre} = -0.042 \text{ mm}$$

All system deformation shape



All element's global node reactions**I. element's global node reactions**

$$[Pg]_I = \begin{bmatrix} 1 & 0 & 0 & 2 & 3 & 4 \\ 1/2 & 1/2 & 0.00 & -1/2 & -1/2 & 0.00 \\ 1/2 & 1/2 & 0.00 & -1/2 & -1/2 & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \\ -1/2 & -1/2 & 0.00 & 1/2 & 1/2 & 0.00 \\ -1/2 & -1/2 & 0.00 & 1/2 & 1/2 & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \end{bmatrix}_{6 \times 6} \frac{AE}{4\sqrt{2}} * \begin{bmatrix} 1 \\ 0 \\ 0 \\ 2 \\ 3 \\ 4 \end{bmatrix}_{6 \times 1} = \begin{bmatrix} 42.300 \\ 0.000 \\ 0.000 \\ -54.444 \\ -35.380 \\ -42.300 \end{bmatrix}_{6 \times 1} / AE = \begin{bmatrix} 8.5498 \\ 8.5498 \\ 0.000 \\ -8.5498 \\ -8.5498 \\ 0.000 \end{bmatrix}_{6 \times 1}$$

II. element's global node reactions

$$[Pg]_{II} = \begin{bmatrix} 0 & 0 & 0 & 1 & 0 & 0 \\ 9/41 & -12/41 & 12/41 & -9/41 & 12/41 & -12/41 \\ -12/41 & 16/41 & -16/41 & 12/41 & -16/41 & 16/41 \\ 12/41 & -16/41 & 16/41 & -12/41 & 16/41 & -16/41 \\ -9/41 & 12/41 & -12/41 & 9/41 & -12/41 & 12/41 \\ 12/41 & -16/41 & 16/41 & -12/41 & 16/41 & -16/41 \\ -12/41 & 16/41 & -16/41 & 12/41 & -16/41 & 16/41 \end{bmatrix}_{6 \times 6} \frac{AE}{\sqrt{41}} * \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \end{bmatrix}_{6 \times 1} = \begin{bmatrix} 0.000 \\ 0.000 \\ 0.000 \\ 42.300 \\ 0.000 \\ 0.000 \end{bmatrix}_{6 \times 1} / AE = \begin{bmatrix} -1.4502 \\ 1.9337 \\ -1.9337 \\ 1.4502 \\ -1.9337 \\ 1.9337 \end{bmatrix}_{6 \times 1}$$

III. element's global node reactions

$$[Pg]_{III} = \begin{bmatrix} 0 & 0 & 0 & 2 & 3 & 4 \\ 1/81 & 8/81 & -4/81 & -1/81 & -8/81 & 4/81 \\ 8/81 & 64/81 & -32/81 & -8/81 & -64/81 & 32/81 \\ -4/81 & -32/81 & 16/81 & 4/81 & 32/81 & -16/81 \\ -1/81 & -8/81 & 4/81 & 1/81 & 8/81 & -4/81 \\ -8/81 & -64/81 & 32/81 & 8/81 & 64/81 & -32/81 \\ 4/81 & 32/81 & -16/81 & -4/81 & -32/81 & 16/81 \end{bmatrix}_{6 \times 6} \frac{AE}{9} * \begin{bmatrix} 0 \\ 0 \\ 0 \\ 2 \\ 3 \\ 4 \end{bmatrix}_{6 \times 1} = \begin{bmatrix} 0.000 \\ 0.000 \\ 0.000 \\ 0.000 \\ -54.444 \\ -35.380 \end{bmatrix}_{6 \times 1} / AE = \begin{bmatrix} 0.4031 \\ 3.2251 \\ -1.6126 \\ -0.4031 \\ -3.2251 \\ 1.6126 \end{bmatrix}_{6 \times 1}$$

IV. element's global node reactions

$$[Pg]_{IV} = \begin{bmatrix} 5 & 0 & 0 & 2 & 3 & 4 \\ 1/2 & -1/2 & 0.00 & -1/2 & 1/2 & 0.00 \\ -1/2 & 1/2 & 0.00 & 1/2 & -1/2 & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \\ -1/2 & 1/2 & 0.00 & 1/2 & -1/2 & 0.00 \\ 1/2 & -1/2 & 0.00 & -1/2 & 1/2 & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \end{bmatrix}_{6 \times 6} \frac{AE}{4\sqrt{42}} * \begin{bmatrix} 5 \\ 0 \\ 0 \\ 2 \\ 3 \\ 4 \end{bmatrix}_{6 \times 1} = \begin{bmatrix} -42.300 \\ 0.000 \\ 0.000 \\ 0.000 \\ -54.444 \\ -35.380 \end{bmatrix}_{6 \times 1} / AE = \begin{bmatrix} -8.5498 \\ 8.5498 \\ 0.000 \\ 8.5498 \\ -8.5498 \\ 0.000 \end{bmatrix}_{6 \times 1}$$

V. element's global node reactions

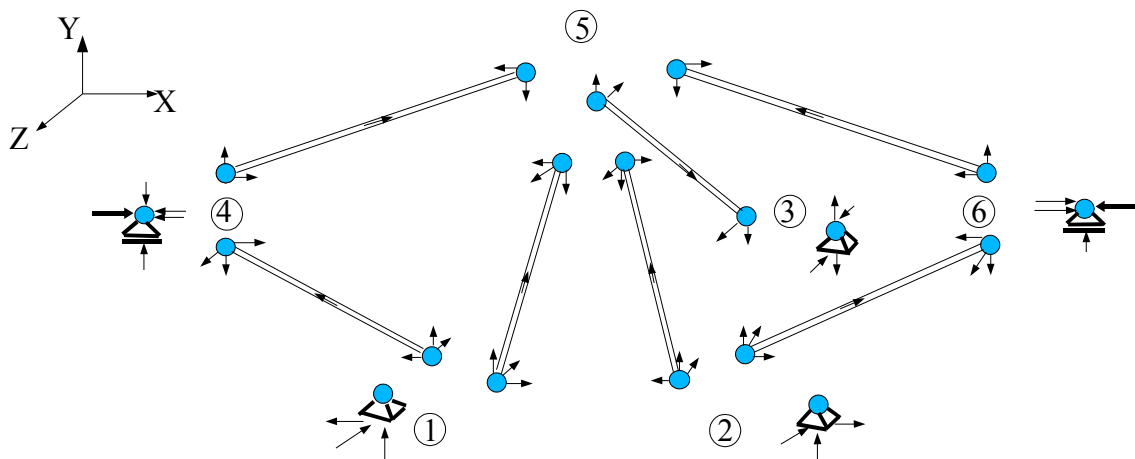
$$[Pg]_v = \begin{bmatrix} 0 & 0 & 0 & 2 & 3 & 4 \\ 1/81 & -8/81 & 4/81 & -1/81 & 8/81 & -4/81 \\ -8/81 & 64/81 & -32/81 & 8/81 & -64/81 & 32/81 \\ 4/81 & -32/81 & 16/81 & -4/81 & 32/81 & -16/81 \\ -1/81 & 8/81 & -4/81 & 1/81 & -8/81 & 4/81 \\ 8/81 & -64/81 & 32/81 & -8/81 & 64/81 & -32/81 \\ -4/81 & 32/81 & -16/81 & 4/81 & -32/81 & 16/81 \end{bmatrix}_{6 \times 6} \frac{AE}{9} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 2 \\ 3 \\ 4 \end{bmatrix} * \begin{bmatrix} 0.000 \\ 0.000 \\ 0.000 \\ 0.000 \\ -54.444 \\ -35.380 \end{bmatrix}_{6 \times 1} / AE = \begin{bmatrix} -0.4031 \\ 3.2251 \\ -1.6126 \\ 0.4031 \\ -3.2251 \\ 1.6126 \end{bmatrix}_{6 \times 1}$$

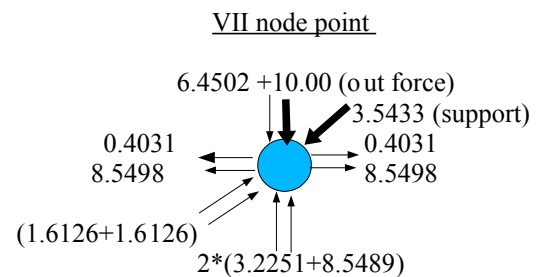
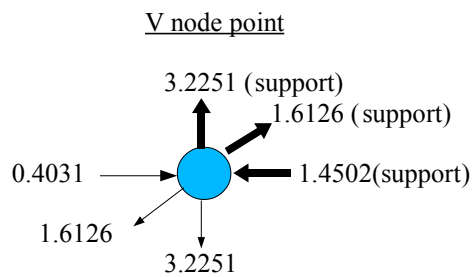
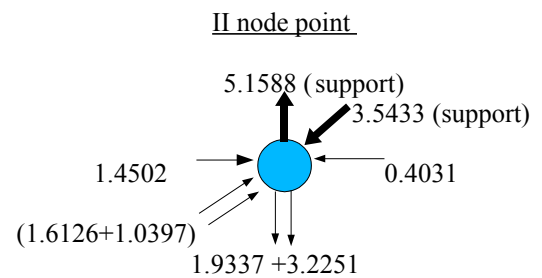
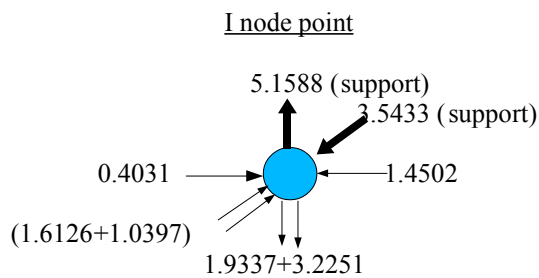
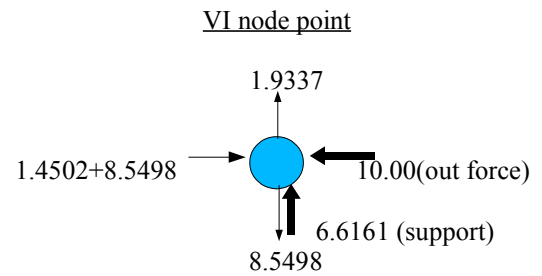
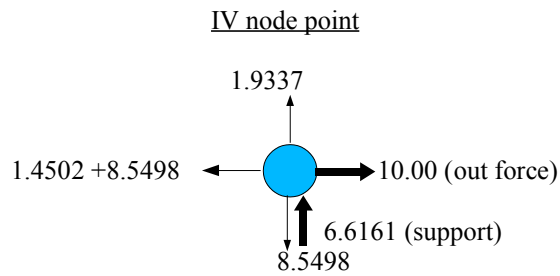
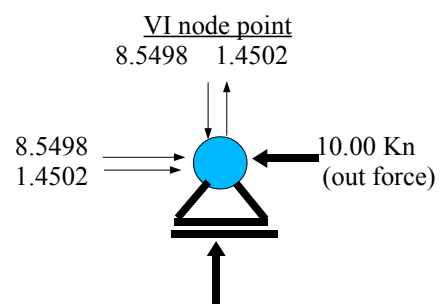
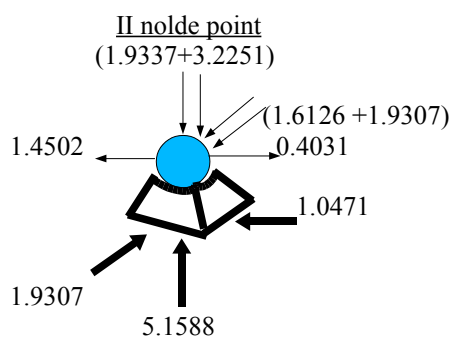
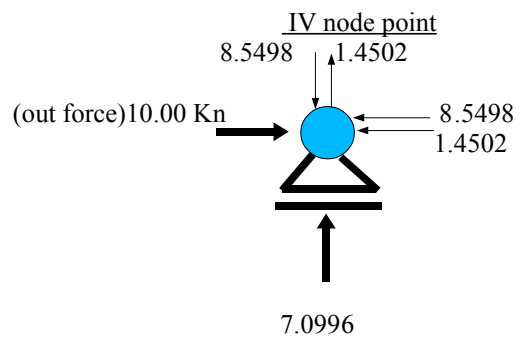
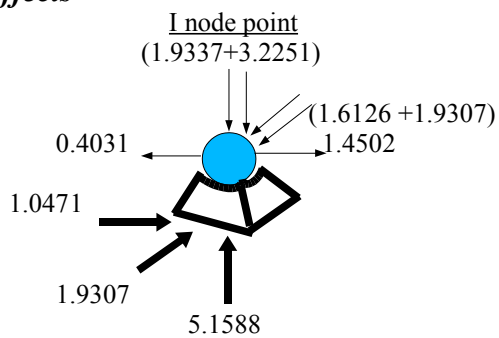
VI. element's global node reactions

$$[Pg]_{vi} = \begin{bmatrix} 0 & 0 & 0 & 5 & 0 & 0 \\ 9/41 & 12/41 & -12/41 & -9/41 & -12/41 & -12/41 \\ 12/41 & 16/41 & -16/41 & -12/41 & 16/41 & -16/41 \\ -12/41 & -16/41 & 16/41 & 12/41 & 16/41 & 16/41 \\ -9/41 & -12/41 & -12/41 & 9/41 & 12/41 & -12/41 \\ -12/41 & 16/41 & -16/41 & 12/41 & 16/41 & -16/41 \\ 12/41 & 16/41 & -16/41 & -12/41 & -16/41 & 16/41 \end{bmatrix}_{6 \times 6} \frac{AE}{\sqrt{41}} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 5 \\ 0 \\ 0 \end{bmatrix} * \begin{bmatrix} 0.000 \\ 0.000 \\ 0.000 \\ -42.300 \\ 0.000 \\ 0.000 \end{bmatrix}_{6 \times 1} / AE = \begin{bmatrix} 1.4502 \\ 1.9337 \\ -1.9337 \\ -1.4502 \\ -1.9337 \\ 1.9337 \end{bmatrix}_{6 \times 1}$$

VII. element's global node reactions

$$[Pg]_{vii} = \begin{bmatrix} 2 & 3 & 4 & 0 & 0 & 0 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \\ 0.00 & 4/5 & 2/5 & 0.00 & -4/5 & -2/5 \\ 0.00 & 2/5 & 1/5 & 0.00 & -2/5 & -1/5 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \\ 0.00 & -4/5 & -2/5 & 0.00 & 4/5 & 2/5 \\ 0.00 & -2/5 & -1/5 & 0.00 & 2/5 & 1/5 \end{bmatrix}_{6 \times 6} \frac{AE}{4\sqrt{45}} \begin{bmatrix} 2 \\ 3 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} * \begin{bmatrix} 0.000 \\ -54.444 \\ -35.380 \\ 0.000 \\ 0.000 \\ 0.000 \end{bmatrix}_{6 \times 1} = \begin{bmatrix} 0.000 \\ -6.4502 \\ -3.2251 \\ 0.000 \\ 6.4502 \\ 3.2251 \end{bmatrix}_{6 \times 1}$$

All system free rigid body effects

Node equilibrium method**Support effects**

All element's local edge node reactions**I. element's local axis edge node effects**

$$[P_L]_I = \begin{bmatrix} 1/\sqrt{2} & 1/\sqrt{2} & 0.00 & 0.00 & 0.00 & 0.00 \\ -1/\sqrt{2} & 1/\sqrt{2} & 0.00 & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 1/\sqrt{2} & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & 1/\sqrt{2} & 1/\sqrt{2} & 0.00 \\ 0.00 & 0.00 & 0.00 & -1/\sqrt{2} & 1/\sqrt{2} & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \end{bmatrix}_{6 \times 6} * \begin{pmatrix} 8.5498 \\ 8.5498 \\ 0.000 \\ -8.5498 \\ -8.5498 \\ 0.000 \end{pmatrix}_{6 \times 1} = \begin{pmatrix} 12.0912 \\ 0.000 \\ 0.000 \\ -12.0912 \\ 0.000 \\ 0.000 \end{pmatrix}_{6 \times 1}$$

II. element's local axis edge node effects

$$[P_L]_{II} = \begin{bmatrix} -3/41 & 4/\sqrt{41} & -4/\sqrt{41} & 0.00 & 0.00 & 0.00 \\ -4/\sqrt{41} & -3/\sqrt{41} & 0.00 & 0.00 & 0.00 & 0.00 \\ 4/\sqrt{41} & 0.00 & -3/\sqrt{41} & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & -3/\sqrt{41} & 4/\sqrt{41} & -4/\sqrt{41} \\ 0.00 & 0.00 & 0.00 & -4/\sqrt{41} & -3/\sqrt{41} & 0.00 \\ 0.00 & 0.00 & 0.00 & 4/\sqrt{41} & 0.00 & -3/\sqrt{41} \end{bmatrix}_{6 \times 6} * \begin{pmatrix} -1.4502 \\ 1.9337 \\ -1.9337 \\ 1.4502 \\ -1.9337 \\ 1.9337 \end{pmatrix}_{6 \times 1} = \begin{pmatrix} 3.0954 \\ 0.000 \\ 0.000 \\ -3.0954 \\ 0.000 \\ 0.000 \end{pmatrix}_{6 \times 1}$$

III. element's local axis edge node effects

$$[P_L]_{III} = \begin{bmatrix} 1/9 & 8/9 & -4/9 & 0.00 & 0.00 & 0.00 \\ -8/9 & 1/9 & 0.00 & 0.00 & 0.00 & 0.00 \\ 4/9 & 0.00 & 1/9 & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & 1/9 & 8/9 & -4/9 \\ 0.00 & 0.00 & 0.00 & -8/9 & 1/9 & 0.00 \\ 0.00 & 0.00 & 0.00 & 4/9 & 0.00 & 1/9 \end{bmatrix}_{6 \times 6} * \begin{pmatrix} 0.4031 \\ 3.2251 \\ -1.6126 \\ -0.4031 \\ -3.2251 \\ 1.6126 \end{pmatrix}_{6 \times 1} = \begin{pmatrix} 3.6283 \\ 0.000 \\ 0.000 \\ -3.6283 \\ 0.000 \\ 0.000 \end{pmatrix}_{6 \times 1}$$

IV. element's local axis edge node effects

$$[P_L]_{IV} = \begin{bmatrix} 1/\sqrt{2} & -1/\sqrt{2} & 0.00 & 0.00 & 0.00 & 0.00 \\ 1/\sqrt{2} & 1/\sqrt{2} & 0.00 & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 1/\sqrt{2} & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & 1/\sqrt{2} & -1/\sqrt{2} & 0.00 \\ 0.00 & 0.00 & 0.00 & 1/\sqrt{2} & 1/\sqrt{2} & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.00 & 1/\sqrt{2} \end{bmatrix}_{6 \times 6} * \begin{pmatrix} -8.5498 \\ 8.5498 \\ 0.000 \\ 8.5498 \\ -8.5498 \\ 0.000 \end{pmatrix}_{6 \times 1} = \begin{pmatrix} 12.0912 \\ 0.000 \\ 0.000 \\ -12.0912 \\ 0.000 \\ 0.000 \end{pmatrix}_{6 \times 1}$$

V. element's local axis edge node effects

$$[P_L]_V = \begin{bmatrix} -1/9 & 8/9 & -4/9 & 0.00 & 0.00 & 0.00 \\ -8/9 & -1/9 & 0.00 & 0.00 & 0.00 & 0.00 \\ 4/9 & 0.00 & -1/9 & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & -1/9 & 8/9 & -4/9 \\ 0.00 & 0.00 & 0.00 & -8/9 & -1/9 & 0.00 \\ 0.00 & 0.00 & 0.00 & 4/9 & 0.00 & -1/9 \end{bmatrix}_{6 \times 6} * \begin{pmatrix} -0.4031 \\ 3.2251 \\ -1.6126 \\ 0.4031 \\ -3.2251 \\ 1.6126 \end{pmatrix}_{6 \times 1} = \begin{pmatrix} 3.6283 \\ 0.000 \\ 0.000 \\ -3.6283 \\ 0.000 \\ 0.000 \end{pmatrix}_{6 \times 1}$$

VI. element's local axis edge node effects

$$[P_L]_{VI} = \begin{bmatrix} 3/\sqrt{41} & 4/\sqrt{41} & -4/\sqrt{41} & 0.00 & 0.00 & 0.00 \\ -4/\sqrt{41} & 3/\sqrt{41} & 0.00 & 0.00 & 0.00 & 0.00 \\ 4/\sqrt{41} & 0.00 & 3/\sqrt{41} & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & 3/\sqrt{41} & 4/\sqrt{41} & -4/\sqrt{41} \\ 0.00 & 0.00 & 0.00 & -4/\sqrt{41} & 3/\sqrt{41} & 0.00 \\ 0.00 & 0.00 & 0.00 & 4/\sqrt{41} & 0.00 & 3/\sqrt{41} \end{bmatrix}_{6 \times 6} * \begin{pmatrix} 1.4502 \\ 1.9337 \\ -1.9337 \\ -1.4502 \\ -1.9337 \\ 1.9337 \end{pmatrix}_{6 \times 1} = \begin{pmatrix} 3.0954 \\ 0.000 \\ 0.000 \\ -3.0954 \\ 0.000 \\ 0.000 \end{pmatrix}_{6 \times 1}$$

VII. element's local axis edge node effects

$$[P_L]_{VII} = \begin{bmatrix} 0.00 & -2/\sqrt{5} & -1/\sqrt{5} & 0.00 & 0.00 & 0.00 \\ 1/\sqrt{2} & 1/\sqrt{2} & 0.00 & 0.00 & 0.00 & 0.00 \\ 1/\sqrt{5} & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & -2/\sqrt{5} & 0.00 \\ 0.00 & 0.00 & 0.00 & 2/\sqrt{5} & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & 1/\sqrt{5} & 0.00 & 0.00 \end{bmatrix}_{6 \times 6} * \begin{pmatrix} 0.000 \\ -6.4502 \\ -3.2251 \\ 0.000 \\ 6.4502 \\ 3.2251 \end{pmatrix}_{6 \times 1} = \begin{pmatrix} 7.2116 \\ 0.000 \\ 0.000 \\ -7.2116 \\ 0.000 \\ 0.000 \end{pmatrix}_{6 \times 1}$$

<i>Element No</i>	<i>Local Element Force</i>	<i>Type</i>
I	12.0912	Pressure (-)
II	3.0954	Pressure (-)
III	3.6283	Pressure (-)
IV	12.0912	Pressure (-)
V	3.6283	Pressure (-)
VI	3.0954	Pressure (-)
VII	7.21156	Pressure (-)