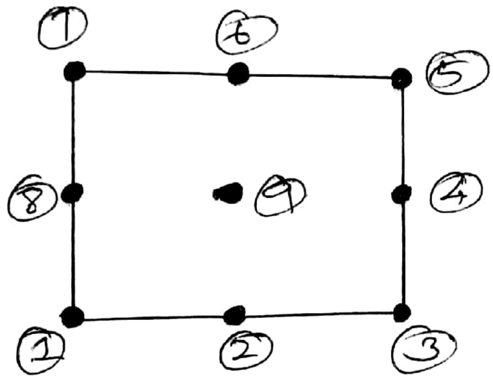
Load vector for L9-polynomials case:



The Lagrange polynomials are

$$F_1 = \frac{1}{4}(\alpha^2-\alpha)(\beta^2-\beta) \qquad F_6 = \frac{1}{2}(\beta^2+\beta)(1-\alpha^2)$$

$$F_2 = \frac{1}{2}(\beta^2-\beta)(1-\alpha^2) \qquad F_7 = \frac{1}{4}(\alpha^2-\alpha)(\beta^2+\beta)$$

$$F_3 = \frac{1}{2}(\alpha^2+\alpha)(\beta^2-\beta) \qquad F_8 = \frac{1}{2}(\alpha^2-\alpha)(1-\beta^2)$$

$$F_4 = \frac{1}{2}(\alpha^2+\alpha)(1-\beta^2) \qquad F_9 = (1-\alpha^2)(1-\beta^2)$$

$$F_5 = \frac{1}{4}(\alpha^2+\alpha)(\beta^2+\beta)$$

At Load application point i.e $(\alpha,\beta) = (0,0) \rightarrow N_1=0\ N_2=1$

$$\delta L_{ext} = pF_1 U_{z12} + pF_2 U_{z22} + pF_3 U_{z32} + pF_4 U_{z42}$$
$$+ pF_5 U_{z52} + pF_6 U_{z62} + pF_7 U_{z72} + pF_8 U_{z82}$$
$$+ pF_9 U_{z92}.$$

Since the Load is applied at $(0,0)$ the δL_{ext} becomes:

$$\delta L_{ext} = pF_9 U_{z92}.$$

∴ ~~$\delta L_{ext} = 1$~~

∴ $\delta L_{ext} = P(1-\alpha^2)(1-\beta^2)\, U_{z92}$

$= -50 \times (1-0^2)(1-0^2)\, U_{z92}$

$= -50\, U_{z92}$.

∴ The Load is applied directly at the central node of the L9 nodes.