Geometric Nonlinearity-Iterative Solution Approach Implementation

Incremental / Iterative Solution Approach -Newton-Raphson Method

$E := 500000 \ \frac{N}{mm^2}$ $A := 100 \ mm^2$ $Z := 25 \ mm$ $L := 2500 \ mm$ $K_s := 1.350 \ \frac{N}{mm}$ $P := -80 \ N$

$mIt := 100$ $\delta := 1 \cdot 10^{-8}$ $n := 15$ $i := 0 .. n + 1$ $\Delta P := \frac{P}{n} = -5.333$

$IncNRSolve(\Delta P, n, \delta, mIt) :=$

$w_{n+1} \leftarrow 0$

$Pa \leftarrow 0$

$cIt_n \leftarrow 0$

for $i \in 1 .. n$

$K_t \leftarrow \left[\left(\frac{E \cdot A}{L}\right) \cdot \left(\frac{Z + w_i}{L}\right)^2\right] + \left[\frac{(E \cdot A)}{L^3}\right] \cdot \left[Z \cdot w_i + \frac{1}{2} \cdot (w_i)^2\right] + K_s$

$\Delta w \leftarrow \frac{\Delta P}{K_t}$

$w_{total} \leftarrow w_i + \Delta w$

$Pa \leftarrow Pa + \Delta P$

$nIt \leftarrow 0$

while 1

$nIt \leftarrow nIt + 1$

$f \leftarrow \left[\frac{(E \cdot A)}{L^3}\right] \cdot \left(Z^2 \cdot w_{total} + 1.5 \cdot Z \cdot w_{total}^2 + 0.5 w_{total}^3\right) + K_s \cdot w_{total} - P$

break if $(|f| < \delta) \vee (nIt \geq mIt)$

$K_t \leftarrow \left[\left(\frac{E \cdot A}{L}\right) \cdot \left(\frac{Z + w_{total}}{L}\right)^2\right] + \left[\frac{(E \cdot A)}{L^3}\right] \cdot \left[Z \cdot w_{total} + \frac{1}{2} \cdot (w_{total})^2\right] + K_s$

$\delta w \leftarrow \frac{-f}{K_t}$

$w_{total} \leftarrow w_{total} + \delta w$

$w_{i+1} \leftarrow w_{total}$

$cIt_{i \leftarrow nIt}$

$\begin{pmatrix} w \\ cIt \end{pmatrix}$

Increment

Residual Force

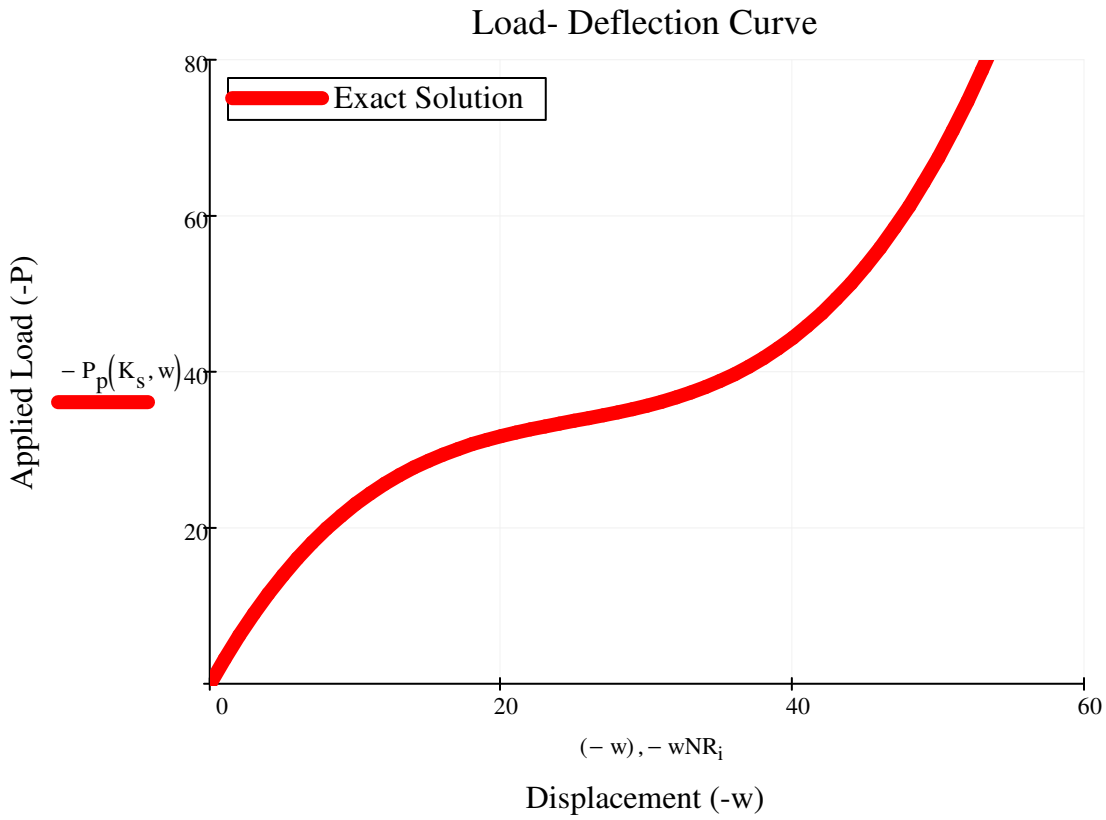
Equilibrium Iterations

$wNR := IncNRSolve(\Delta P, n, \delta, mIt)$ $wNRr := wNR_1$ $cItNR := wNR_2$

$$P_p(K_s, w) := \left[\left(\frac{E \cdot A}{L^3}\right) \cdot \left(Z^2 \cdot w + 1.5 \cdot Z \cdot w^2 + 0.5 \cdot w^3\right) + K_s \cdot w\right]$$

$w := 0 .. -100$

I can't get the second plot of Newton Raphson iterative solution(Blue dots) as shown in the picture below this plot. I also need the plot " Number of iterations" vs Increment" shown 2 pictures below



$mIt := 100 \quad n := 15 \quad i := 1 .. n + 1 \quad P := -80 \quad \Delta P := \frac{P}{n}$

$wNR := IncNRSolve(\Delta P, n, \delta, mIt) \quad wNRr := wNR_1 \quad cItNR := wNR_2$