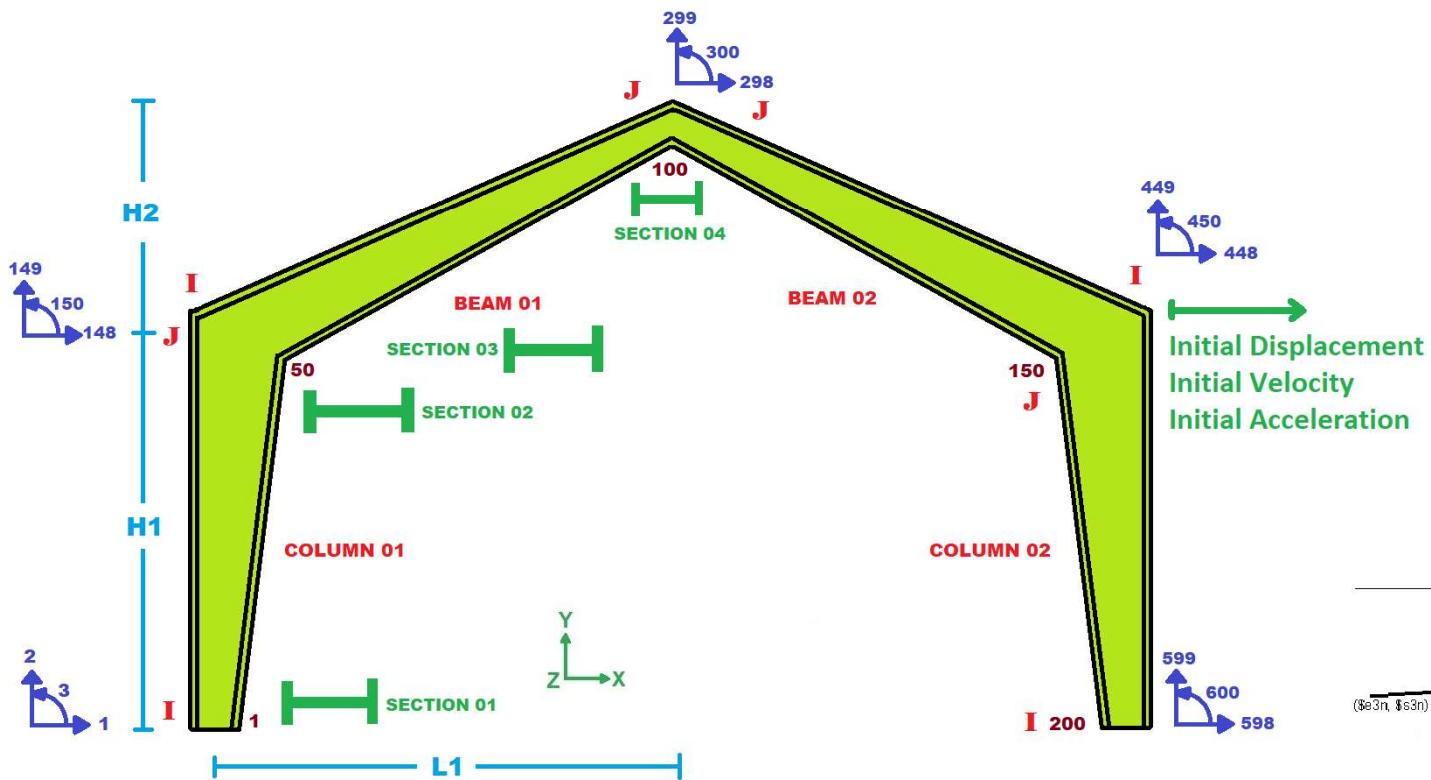


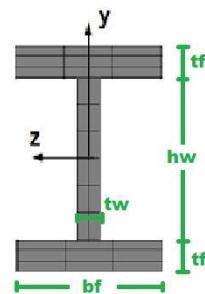
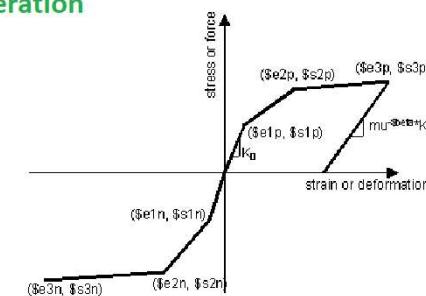
>> IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL <<

COMPARATIVE FREE-VIBRATION ANALYSIS OF A MDOF STRUCTURE: ELASTIC VS INELASTIC RESPONSE USING OPENSEES. NONLINEAR DYNAMIC ANALYSIS OF A NONPRISMATIC STEEL GABLE FRAME I SECTION COLUMN WITH FINITE PRISMATIC COLUMN

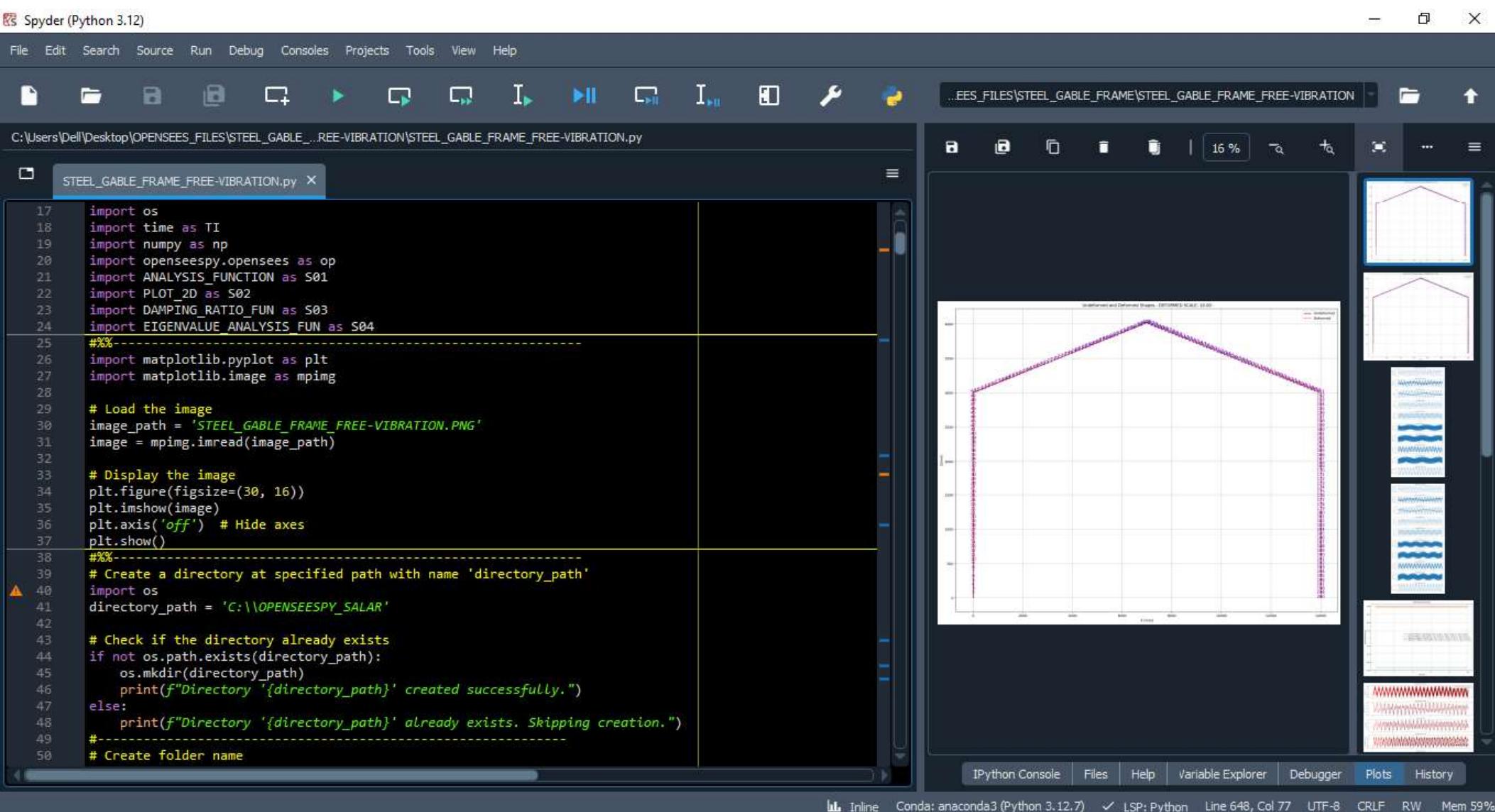
WRITTEN BY SALAR DELAVAR GHASHGHAEI (QASHQAI)



Initial Displacement
Initial Velocity
Initial Acceleration







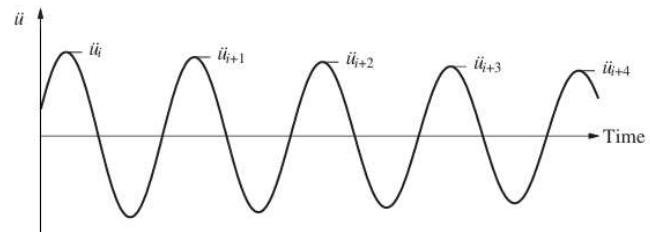
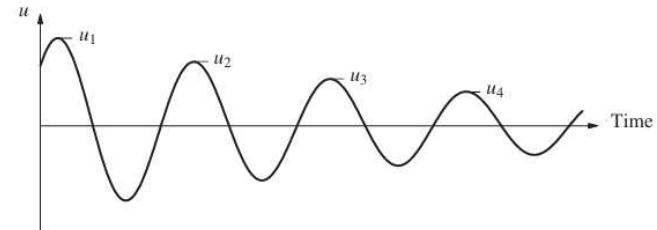
VISCOUSLY DAMPED FREE VIBRATION

$$m\ddot{u} + c\dot{u} + ku = 0$$

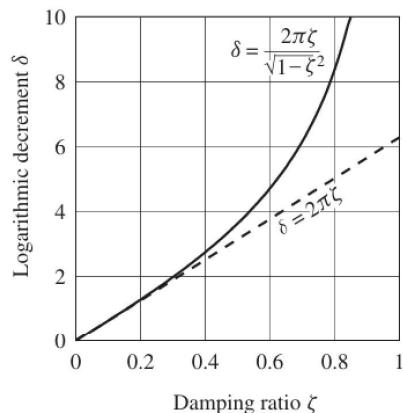
$$\ddot{u} + 2\xi\omega_n\dot{u} + \omega_n^2 u = 0$$

$$\omega_n = \sqrt{k/m} \quad \zeta = \frac{c}{2m\omega_n} = \frac{c}{c_{cr}} \quad \omega_D = \omega_n \sqrt{1 - \zeta^2}$$

$$u(t) = e^{-\zeta\omega_n t} \left[u(0) \cos \omega_D t + \frac{\dot{u}(0) + \zeta\omega_n u(0)}{\omega_D} \sin \omega_D t \right]$$



Exact Damping Ratio: 1.50494054e-04



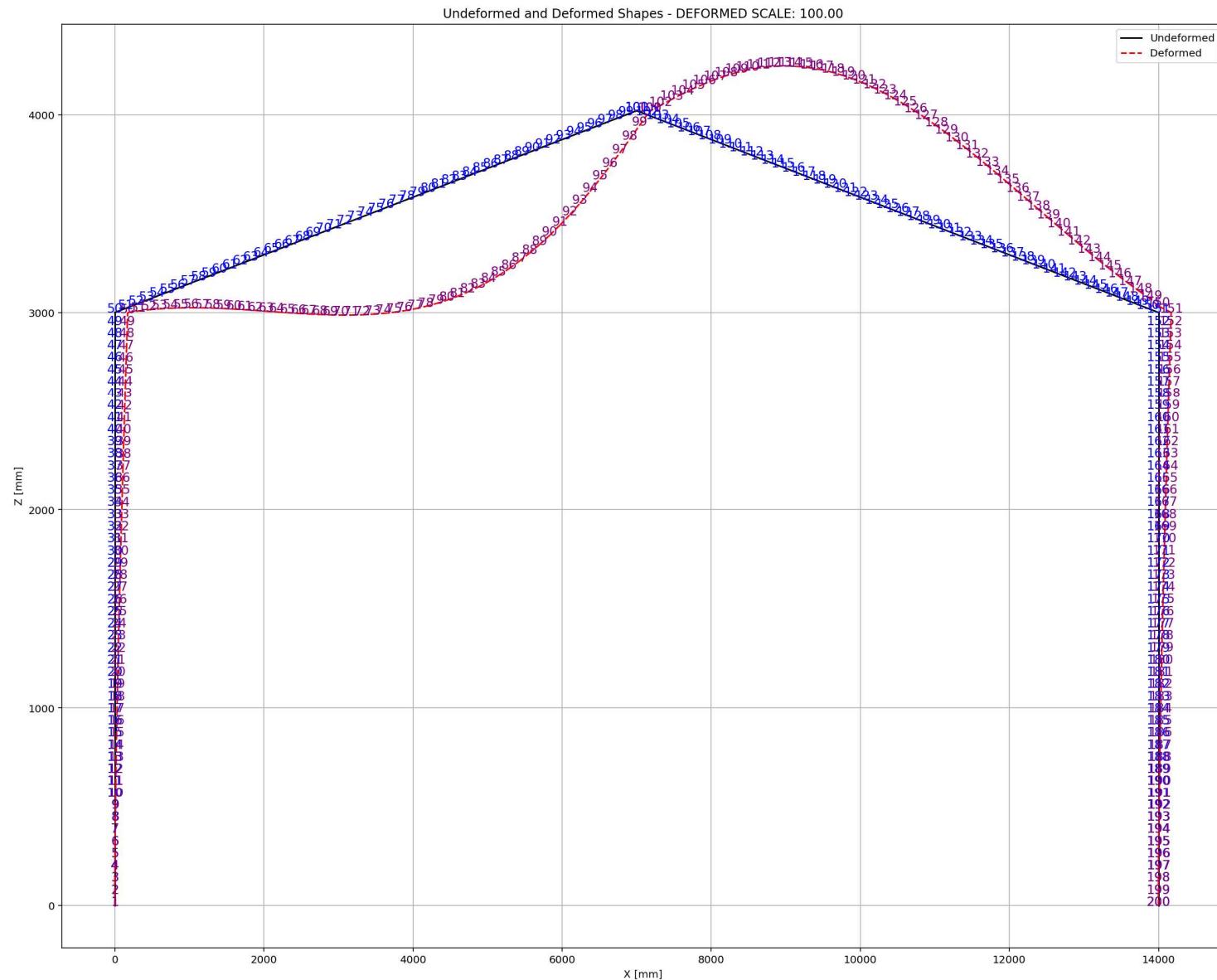
Decay of Motion

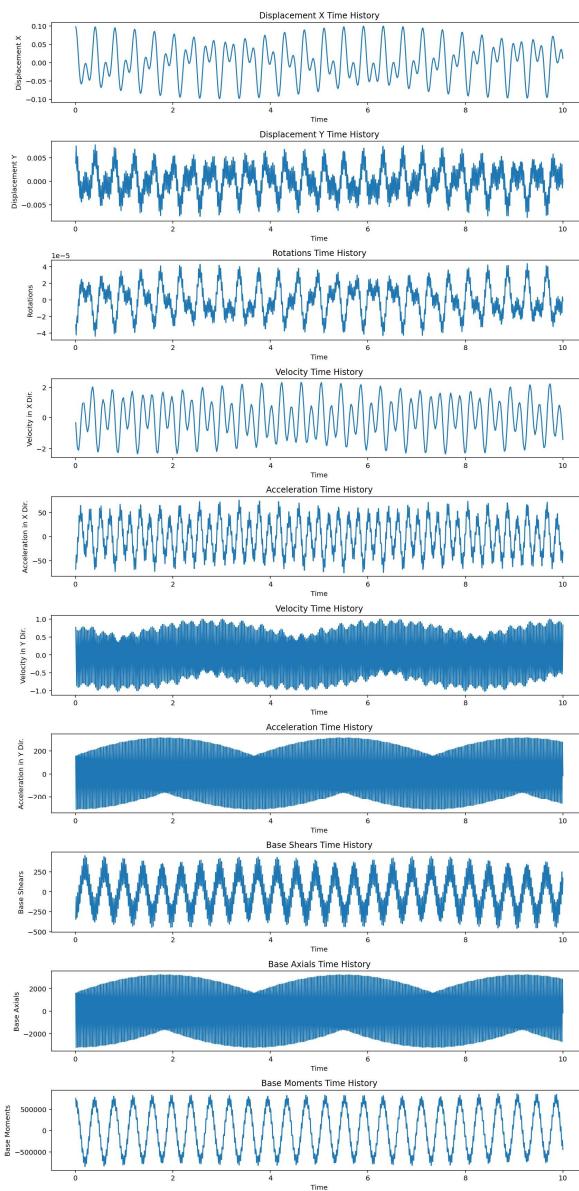
$$\delta = \ln \frac{u_i}{u_{i+1}} = 2\pi \zeta \text{ (APPROXIMATE RELATION)}$$

$$\delta = \ln \frac{u_i}{u_{i+1}} = \frac{2\pi \zeta}{\sqrt{1 - \zeta^2}} \text{ (EXACT RELATION)}$$

EXACT AND APPROXIMATE RELATIONS BETWEEN LOGARITHMIC DECREMENT AND DAMPING RATIO

FREE-VIBRATION ANALYSIS FOR INELASTIC STRUCTURE





FREE-VIBRATION ANALYSIS FOR ELASTIC STRUCTURE

