**Simple beam under central step load.**

The dynamic response of a uniform simple beam subjected to a central step-function load as shown in Fig. 1 will be evaluated.

*t*

*EI, *

*p*(*t*)

*L/2*

*L/2*

*p*(*t*)

*P*0

Fig. 1 Simple beam under central step load

Length *L* = 6.0; height = 0.2; thickness = 0.1; *E* = 1.0x107; *ν* = 0.3; mass density = 50. Loading: unit step load at mid-span.

Analytical vertical displacement solution (Clough and Penzien, 1993) at arbitrary cross section is given by



in which , 

and represents the mass per unit length.

The analytical vertical displacement solution at mid-span location and the finite element solutions by X-SEA using a mesh of six beam elements are plotted in the graph follows.



Fig. 2 Dynamic response of a uniform beam under central step load