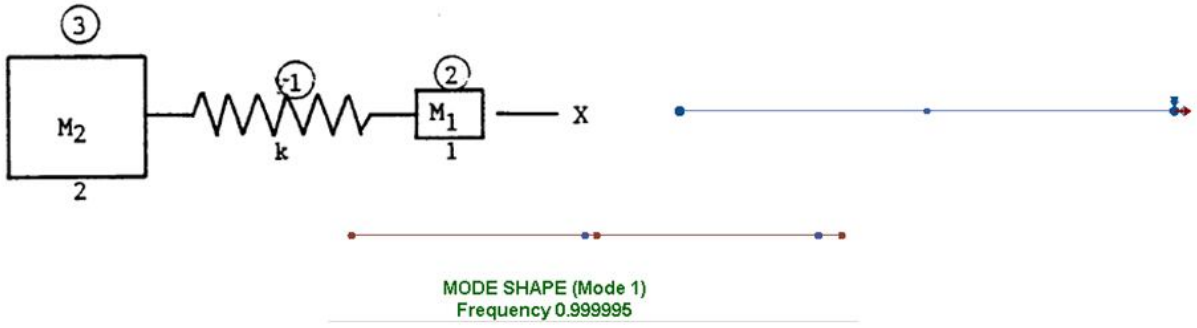
Random vibration analysis of a SDOF system subjected to white noise ground acceleration



Material property : (Stiffness: K = 39.478 *in/lb* (Translational spring),Mass: m_1 = 1.0 *lb-sec*^{2}*/in*,m_2 = 1.0x10^6*lb-sec*^{2} */in*)

Element type : 2-D translational spring element,2-D point mass element. A single-degree-of-freedom (SDOF) system is subjected to a white noise support excitation. The viscous damping ratio is 0.4, and input is a two sided white noise ofintensity:S_0 =100 × 4 π (*in*^{2}*/sec*^{4})/*Hz*.The large mass element is attached to support node of the SDOF system to obtain the absolute responses. The constraint at the support point in the direction of excitation (U_X at node 1 in this case) is released and a very large point mass is added to the released degree of freedom (DOF). An eigenvalue analysis using lumped mass formulation is carried out to obtain the two modes of vibration. In the random vibration analysis, a force of magnitude equal to the large mass times the ground acceleration value has to be applied to the released DOF.U_X at node 1 is constrained.

Finite element statistics :

Number of nodes	Number of elements	Degrees of freedom
2	3	1

Output parameters	Theoretical value	FEAST^{SMT}	NISA2®
Natural frequency (Hz)	1.0004	0.9999	1.0004
RMS velocity (in/sec)	7.9057	7.9158	7.9308
RMS displacement (in)	1.2582	1.2598	1.2641