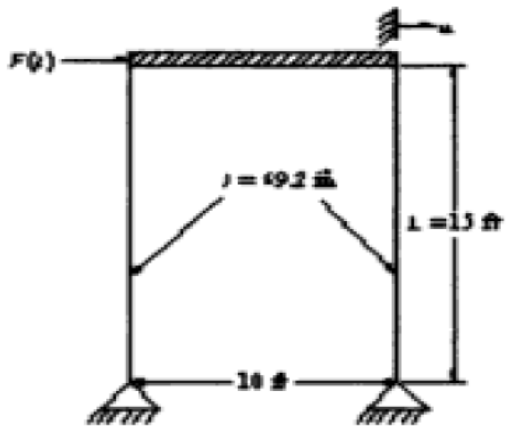
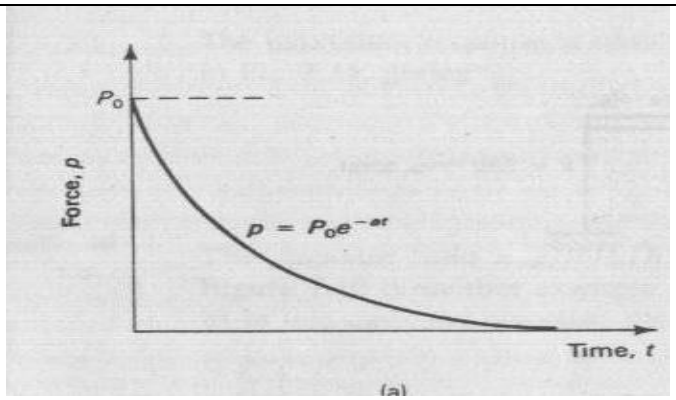
SE-506 SEISMIC DESIGN OF STRUCTURES
STRUCTURAL DYNAMICS TERM PROJECT

Teacher Incharge: DR. IRFAN-UL-HASSAN

Using class lectures, Books prescribed, and tutorials solve the following structural dynamics engineering problems comprehensively.

1.	Perform TIME HISTORY ANALYSIS on Example 3.9 (Structural Dynamics by M. Paz & W. Leigh - FIFTH EDITION) using **SAP2000/ETABS**. Time history is to be applied on applied force. 
2.	Perform TIME HISTORY ANALYSIS on Example 3.10 (Structural Dynamics by M. Paz & W. Leigh - FIFTH EDITION) using **SAP2000**. Herein Time history function is to be applied on ground motion.
3.	Determine the response of a structure subjected to blast loading on the structure of Problem 2 and 3 of the pattern as shown in the Figure. Assume the damping equal to 15% of the critical damping. Develop a computer program in any computer language to solve this problem. Given Po = 140 k, maximum time = 0.5 sec.

	
4.	(a) Solve any multistorey concrete frame building modelled in 3D in ETABS/SAP using Response Spectrum Analysis for ELCENTRO EQ., Show the results obtained for the RS analysis and storey response plots. (b) Perform TIME HISTORY ANALYSIS on any multi Storey concrete building in **SAP2000/ETABS b**y employing any suitable Time-History function available. Show the results. Differentiate between Time-History and Response Spectrum Analysis carried out in above examples.
5.	A one-story reinforced-concrete building is idealized for structural analysis as a massless frame supporting a dead load of 10 kips at the beam level. The frame is 24 ft wide and 12 ft high. Each column, clamped at the base, has a 10-in.-square cross section. The Young's modulus of concrete is 3×10^3 ksi, and the damping ratio of the building is estimated as 5%. If the building is to be designed for the design spectrum of Fig. 6.9.5 scaled to a peak ground acceleration of 0.5g, determine the design values of lateral deformation and bending moments in the columns for two conditions: **(a)** The cross section of the beam is much larger than that of the columns, so the beam may be assumed as rigid in flexure. Solution page 150, 151 **(b)** The beam cross section is much smaller than the columns, so the beam stiffness can be ignored. Comment on the influence of beam stiffness on the design quantities. [for Fig. 6.9.5 see book by A.K. Chopra]
6.	For the design earthquake at a site, the peak values of ground acceleration, velocity, and displacement have been estimated: $\ddot{u}_{go} = 0.5$g, $\dot{u}_{go} = 24$ in./sec, and $u_{go} = 18$ in. For systems with 2% damping ratio, construct the median design spectrum and median-plus-one-standard-deviation design spectrum. **(a)** Plot both spectra, together, on four-way log paper. **(b)** Plot the median-plus-one-standard-deviation spectrum for pseudo-acceleration on log-log paper, and determine the equations for $A(T_n)$ for each branch of the spectrum and the period values at the intersections of the branches. **(c)** Plot the spectrum of part (b) on a linear-linear graph (the T_n scale should cover the range of 0 to 5 sec).

Date of Submission and Evaluation : Sooner after final exams. 23-27 May, 2019