Problem 1

The six-story steel Special Moment Resisting Frame (SMRF) shown in Fig. 1 is to be designed per ASCE 7-05. The building is rectangular in shape and is braced in the North-South direction by two exterior SMRFs. The roof deck dead loads are 60 psf. The dead loads at each floor deck (including suspended ceiling, ducts and external curtain walls) are 80 psf. The weight of the partitions at each floor level is 10 psf and is treated as dead load. The building is located in a site class D with mapped spectral accelerations $S_s = 1.6 \, g$ and $S_1 = 0.70 \, g$. 

Figure 1 – Six-Story Steel SMRF Structure.
a) Determine the seismic design base shear for the North-South direction per ASCE 7-05 equivalent lateral force procedure. Use the formula $T_a = 0.1N$ to estimate the fundamental period of vibration of the structure.

b) Determine the vertical distribution of the design seismic forces on each SMRF. Include the effect of accidental eccentricity and assume rigid floor diaphragms.

**Problem 2**

For the building in the assignment #5 using the results you obtained in the same homework:

a) Determine the spectral capacity of the structure considering (i) the first mode only and (ii) the first three modes.

b) Using the NSPECTRA package, determine the mean inelastic spectra for the following reduction factors: $R=1$ (elastic), 2, 3, 4, 6, 8, 10 for the set of 20 accelerograms provided in the second example on the website.

c) Using the spectral capacity obtained in (a) and the inelastic spectra obtained in (b) determine the expected base shear and the expected top building deflection.

d) Compare the dynamic expected response obtained in (c) for one of the motions in the set, using the IDARC program (use the input file from assignment #5 with adequate change of accelerogram). Comment on the results.
Problem 3

Briefly describe the potential problems associated with the seismic behavior of each of the building illustrated in Fig. 2.

![Diagram of buildings with potential seismic problems]

Figure 2 – Buildings with Potential Seismic Problems.