Problem 8

a) The latitude and longitude of Shattuck and Addison are 37.87 and -122.26 respectively.

From USGS site we get the following values for the 10% in 2% in 50 years earthquake.

	10% in 50 years	2% in 50 years
PGA (g)	**0.74**	**1.21**
$SA_{0.2}$ (g)	**1.72**	**2.99**
SA_1 (g)	**0.66**	**1.15**

The above values correspond to soil class "B" and to 5% damping.

b) Now we need to modify the above values to take into account that our building is not on soil "B" but on soil "D" (stiff soil). The statement of the problem only requires you to compute the values for the 2% in 50 years event. So, we use tables 3.3-1 and 3.3-2 from FEMA 450 and we get the following results.

$F_a = 1.0$ and $F_v = 1.5$

	2% in 50 years
$SA_{0.2}$ (g)	**2.99**
SA_1 (g)	**1.725**

c) We multiply the 2% in 50 years event by 2/3 to get the design earthquake. We get

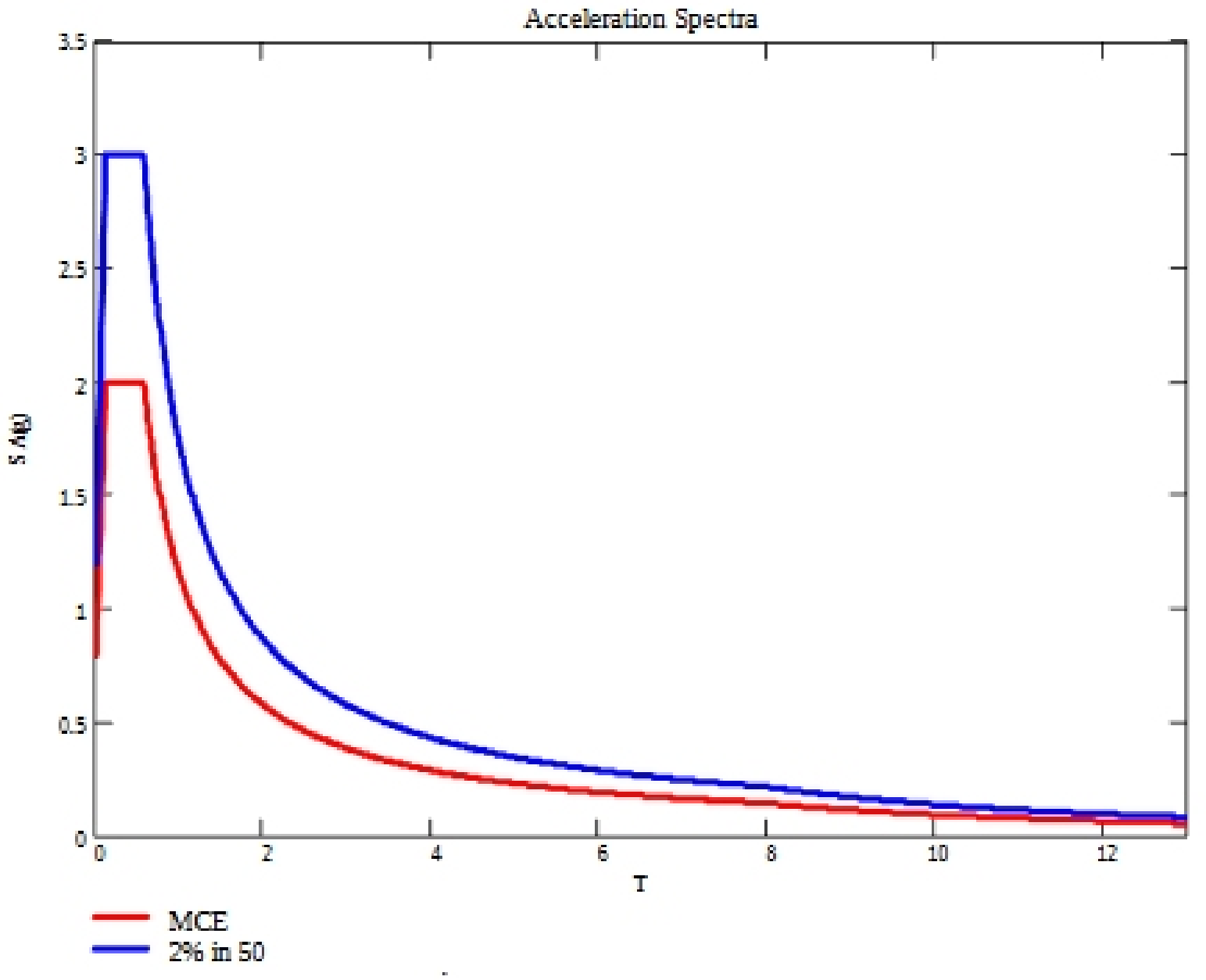
	Design Earthquake (MCE)
$SA_{0.2}$ (g)	**1.99**
SA_1 (g)	**1.15**

d) We use figure 3.3.17 to find T_L. T_L is the period at which we pass from constant velocity spectrum to constant displacement.

$T_L = 8$ sec

CE227/2007 Solution to Problem 8

e) We plot the SA spectra for the 2% in 50 years and for the MCE event.



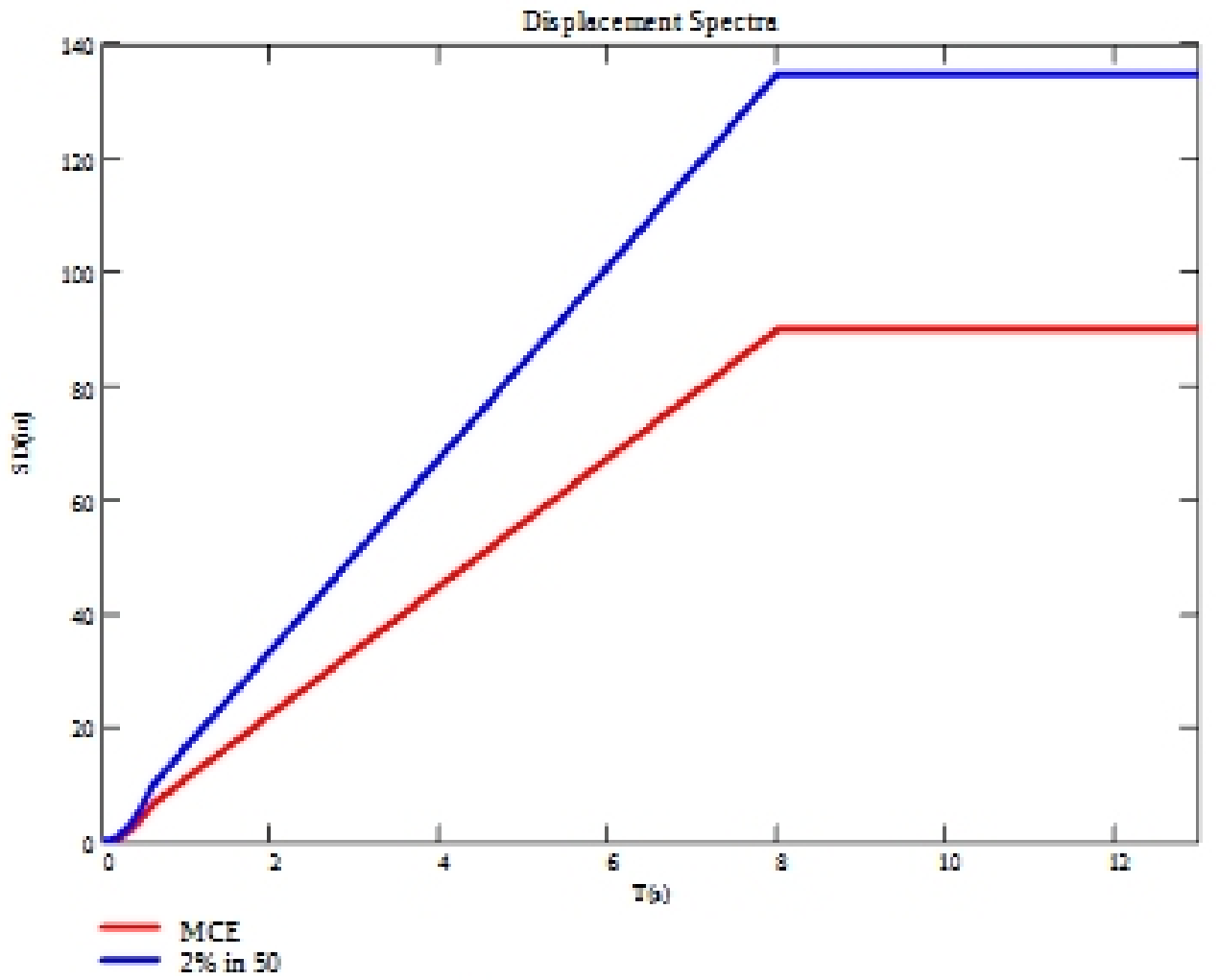
From the above spectra we can identify the PGA values as $0.4SA_{0.2}$.

	MCE	2% in 50 years
PGA (g)	**0.8**	**1.2**

The value for the 2% in 50 years is exactly equal with the USGS value for the same event. It seems that the USGS approximation for PGA is almost the same with the approximation we did constructing the spectrum (i.e. PGA = $0.4SA_{0.2}$). Moreover for this value of SA, $F_a = 1$.
The PGA value for the MCE and for the 10% in 50 years are close but not identical. This is due to the fact that MCE is just 2/3 of the 2% in 50 years event and not the 10% in 50 years event. (We are comparing different events…)

f) i) The SA spectrum is already plot at the previous question
ii)

CE227/2007 Solution to Problem 8



iii)