CEG8308 SEISMIC RESISTANT DESIGN
TUTORIAL WITH EERA

GROUND RESPONSE ANALYSIS

The soil deposit is composed by a 45 m thick layer of soft clay, with unit weight equal to 19.66kN/m^3, overlying a rigid bedrock. The input motion is represented by the Ricker wavelet reported in Figure 1, characterised by a frequency of 0.5Hz and maximum acceleration of 0.2g.

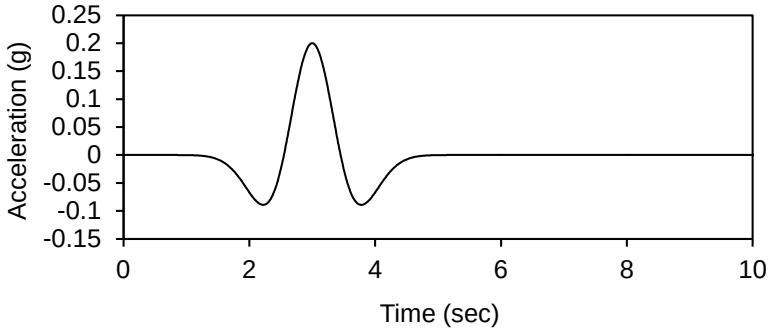
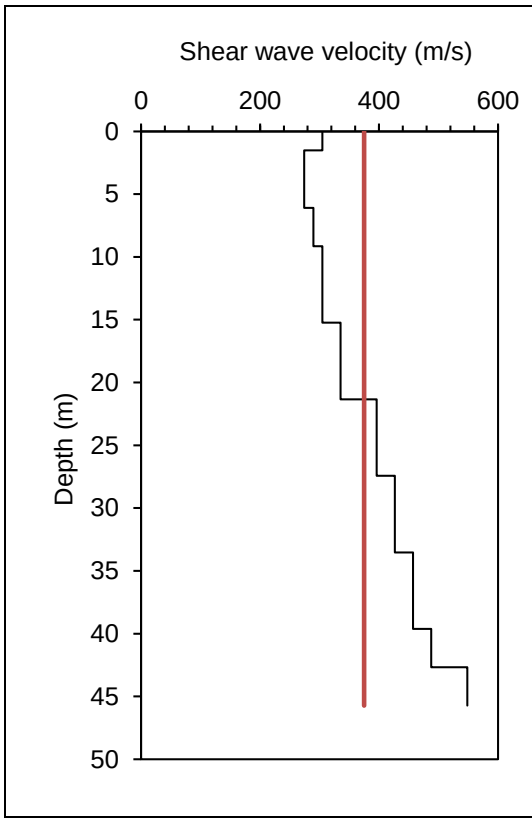


Figure 1. Input motion

Using the code EERA:

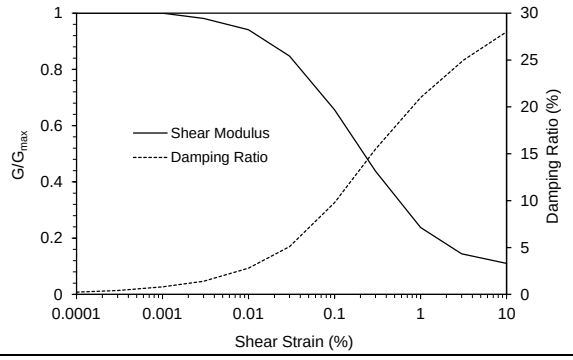
1. Analyse the ground response of the soil deposit, assuming a linear elastic behaviour of the soil and a shear wave velocity equal to 375m/s constant with depth.

2. Analyse the same problem, but assuming the shear wave velocity (*Vs*) profile reported below:



Depth (m)	Vs (m/s)
0.0	304.8
1.5	304.8
1.5	274.32
3.0	274.32
3.0	274.32
6.0	274.32
6.0	289.56
9.0	289.56
9.0	304.8
12.0	304.8
12.0	304.8
15.0	304.8
15.0	335.28
18.0	335.28
18.0	335.28
21.0	335.28
21.0	396.24
24.0	396.24
24.0	396.24
27.0	396.24
27.0	426.72
30.0	426.72
30.0	426.72
33.0	426.72
33.0	457.2
36.0	457.2
36.0	457.2
39.0	457.2
39.0	487.68
42.0	487.68
42.0	548.64
45.0	548.64

3. Analyse the ground response of the soil deposit, assuming a shear wave velocity equal to 375m/s constant with depth and a non-linear soil behaviour represented by the following G-γ and D-γ curves:



Strain (%)	G/G_{max}	Strain (%)	Damping (%)
0.0001	1	0.0001	0.24
0.0003	1	0.0003	0.42
0.001	1	0.001	0.8
0.003	0.981	0.003	1.4
0.01	0.941	0.01	2.8
0.03	0.847	0.03	5.1
0.1	0.656	0.1	9.8
0.3	0.438	0.3	15.5
1	0.238	1	21
3	0.144	3.16	25
10	0.11	10	28

4. Analyse the ground response of the soil deposit, assuming the shear wave velocity (*Vs*) profile reported above and a non-linear soil behaviour represented by the same G-γ and D-γ curves given before.

5. What happens in Case 1 if the input motion is represented by a Ricker wavelet characterised by a frequency of 1.0Hz and maximum acceleration of 0.2g?

Discuss the results of the ground response analysis in terms of natural frequency of the deposit, amplification function, maximum acceleration profile and Fourier and Response spectra at different depths. Compare the results with the analytical solution.