Dynamics of Structures, 2023–2023
Individual Assignment for AVAZ NASAB JASEM

Your paper must be not longer than 8 A4 pages, comprising the title page (hint: this title page has text in it), and must be written using a character size not less than 12 pt, to accomodate for my failing eyesight.

You must submit your paper before the call you want to answer, in the form of a `ZIP` archive containing not only the paper itself, in PDF format, but also a sub-directory containing the modified MATLAB code you used to produce the requested results (hopefully with a `main.m` file that I can run to replicate all your results).

You will submit your `ZIP` archive using a WeBeep consignment folder, according to a deadline that will be communicated with due advance with respect to each call date.

Please, use the `ZIP` format and not anything else, thank you.

In your paper you must

1. detail how you modified the code to achieve the requested results, and
2. show the requested graphical outputs in a clear, correctly annotated way:
   - each graph must have an explicative title,
   - both axes must be labelled with the name of the physical quantity concerned and the unit of measure used.

Please consider that **improperly annotated graphs will be considered completely wrong** when I will grade your work.

You can find the earthquake acceleration record you'll need in this `ZIP` archive[1].

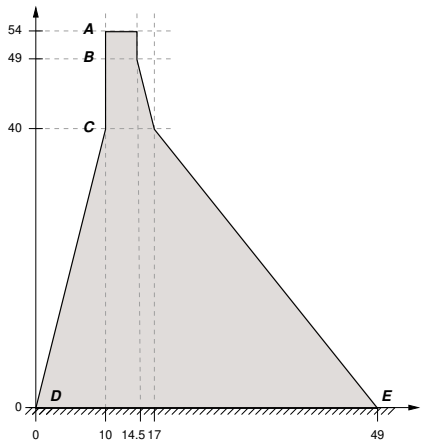
1 Modal Analysis

Consider the **pristine configuration** of the dam and your **refined mesh**.

With reference to the figure, only for the labelling of points, consider the following two loading conditions:

1. a single unit load $f_0 = +1\,\mathrm{N}$, acting on point `B`, applied istantaneously at time $t = 0$,
2. two unit loads, $f_1 = +1\,\mathrm{N}$ acting on point `B` and $f_2 = -1\,\mathrm{N}$ acting on point `A`, applied istantaneously at time $t = 0$.

[1] https://drive.google.com/file/d/1PfImpPvzxj1TZ1JeWhfL2KckNxJC8Nnh



For the first four modes, and for each of the two loading conditions, compute

- the modal partecipation factors Γ_i,
- the modal displacements, normalized with respect to $D(\omega_i, \zeta_i)$, the Response Function,
- the static correction vector for the displacements.

For each of the two loading conditions, display the modal partecipation factors and the 4+1 displacements fields.

2 Direct Integration

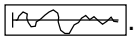
The dam is subjected a seismic excitation, described in the file `LomaPrieta1989-115.txt`.

Considering the pristine configuration of the dam and your refined mesh and disregarding any static load, analyze its seismic response using, at your discretion, one of the constant acceleration method and the Wilson's θ method.

To take into account damping, use a damping matrix, $\mathbf{C} = \alpha\mathbf{M} + \beta\mathbf{K}$, with the coefficients chosen so that the damping ratios for mode 1 and mode 3 equal 0.03.

Your report must then comprise

1. the plot of the ground acceleration;
2. the plot of the horizontal displacement of point A;
3. the plot of the overturning moment at the base of the dam, with respect to E.

> **Suggestion:** for the plots of earthquakes and earthquake responses, use a figure wide and short  .