HW 5

MAE 263F

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1. After generating the mesh for the plate model, the structure was analyzed under its own mass. Once the simulation settled into steady behavior, the tip displacement was extracted. This numerical displacement was then compared with the theoretical Euler–Bernoulli prediction.

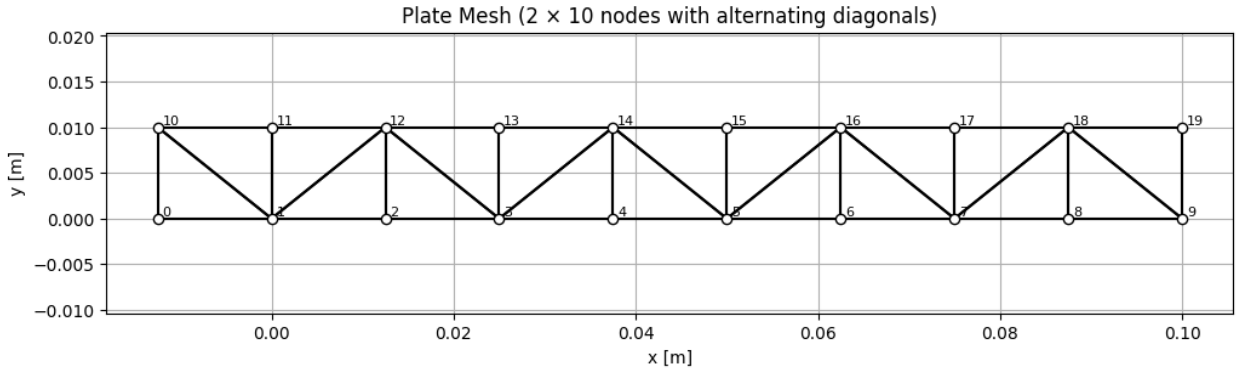
The two values are:

- Simulated steady displacement:
$$\delta_{\text{plate}} = 0.03483798189574103 \text{ m}$$
- Euler–Bernoulli beam prediction:
$$\delta_{\text{EB}} = 0.03678750000000001 \text{ m}$$

To quantify the difference, the normalized error was calculated as:

$$\frac{\delta_{\text{EB}} - \delta_{\text{plate}}}{\delta_{\text{EB}}} \times 100$$

This yields a relative difference of approximately 5.3%.
This small deviation is consistent with expected discrepancies between a discrete plate model and a simplified analytical beam approximation.



2. The time-dependent deflection of the plate tip is plotted. The response begins with oscillations due to the dynamic loading from gravity, but these oscillations gradually decay.

By about 17.5 seconds, the displacement stabilizes with fluctuations below 2%, indicating that the system has effectively reached steady state. The final displacement value at the end of the time window is taken as the converged steady-state deflection.