

NPTEL course offered by IIT Madras
Computer methods of analysis of offshore structures

Tutorial 9: Dynamic analysis

Answer all questions

Total marks: 25

1. What are essential characteristics of a dynamic system?

Equation of motion is used to characterize the response mathematically

- Dynamic system need to be modelled

- Essential features of a dynamic system

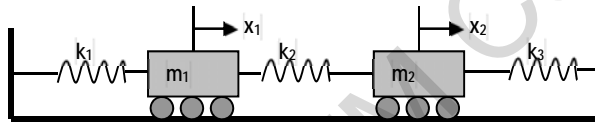
✓ M - (1) Mass - representing the inertia characteristics

✓ K - (2) stiffness - representing the restoring force capacity

✓ C - (3) damping - representing the frictional characteristics and energy loss in the system

✓ $F(t)$ - (4) An excitation force, representing the external force (Ehrman)

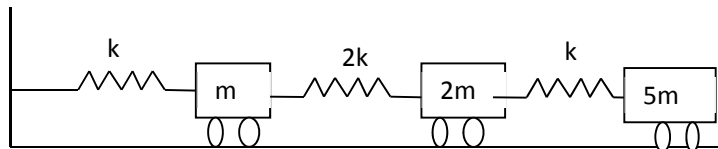
2. Determine the influence co-efficient matrix for the multi-degrees-of-freedom system shown in the below figure:



3. Determine the fundamental frequency of the system whose $[M]$ and influence coefficient matrix δ are given as below:

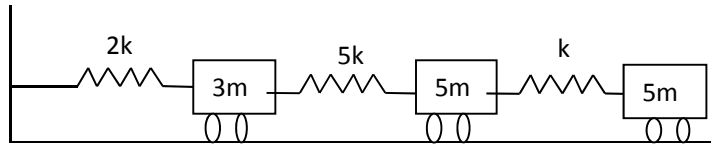
$$M = \begin{bmatrix} 60 & 0 & 0 \\ 0 & 100 & 0 \\ 0 & 0 & 80 \end{bmatrix}, [\delta] = \begin{bmatrix} 6 & 5 & 3 \\ 5 & 7 & 4 \\ 3 & 4 & 6 \end{bmatrix}$$

4. Evaluate the frequency and mode shape for the MDOF system using Influence coefficient method. Use Dunkerley's method to evaluate natural frequency of the system.



$$m = 35 \text{ kN}; K = 1000 \text{ kN/m}$$

5. Evaluate the fundamental frequency and mode shape for the MDOF system using Stodola method.



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