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Assignment 6

Q1

$$\begin{bmatrix} 2-\lambda & 8 & 10 \\ 8 & 4-\lambda & 5 \\ 10 & 5 & 7-\lambda \end{bmatrix} \qquad \vec{x}_0 = [1 \;\; 1 \;\; 1]^T = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

$$A\vec{x}_i = \vec{\lambda}\vec{x}_{i+1}$$

$$\begin{bmatrix} 2 & 8 & 10 \\ 8 & 4 & 5 \\ 10 & 5 & 7 \end{bmatrix} \begin{Bmatrix} 1 \\ 1 \\ 1 \end{Bmatrix} = \begin{Bmatrix} 20 \\ 17 \\ 22 \end{Bmatrix} = 22 \begin{Bmatrix} 0.9091 \\ 0.7727 \\ 1 \end{Bmatrix}$$

λ_1 = 22, $\vec{x}'_1$ = $\begin{Bmatrix} 0.9091 \\ 0.7727 \\ 1 \end{Bmatrix}$

$$\begin{bmatrix} 2 & 8 & 10 \\ 8 & 4 & 5 \\ 10 & 4 & 7 \end{bmatrix} \begin{Bmatrix} 0.9091 \\ 0.7727 \\ 1 \end{Bmatrix} = \begin{Bmatrix} 17.9998 \\ 15.3636 \\ 19.9545 \end{Bmatrix} = 19.9545 \begin{Bmatrix} 0.902 \\ 0.7699 \\ 1 \end{Bmatrix}$$

$$\varepsilon_a = \left| \frac{19.945 - 22}{19.9545} \right| \times 100 = 10.25$$

$$\begin{bmatrix} 2 & 8 & 10 \\ 8 & 4 & 5 \\ 10 & 4 & 7 \end{bmatrix} \begin{Bmatrix} 0.902 \\ 0.7699 \\ 1 \end{Bmatrix} = \begin{Bmatrix} 17.9632 \\ 15.2956 \\ 19.8695 \end{Bmatrix} = 19.8695 \begin{Bmatrix} 0.9041 \\ 0.7698 \\ 1 \end{Bmatrix}$$

$$\varepsilon_a = \left| \frac{19.865 - 19.9545}{19.8695} \right| \times 100$$

$$= 0.43\% < \varepsilon_s$$

largest $\lambda = 19.8695$

eigen vector

$$\frac{1}{\sqrt{0.9041^2 + 0.7698^2 + 1^2}} \begin{Bmatrix} 0.9041 \\ 0.7698 \\ 1 \end{Bmatrix}$$

Assignment 6

Q 2

$$\left(\frac{k_1 + k_2}{m_1} - \omega_n^2\right) x_1 - \frac{k_2}{m_1} x_2 = 0$$

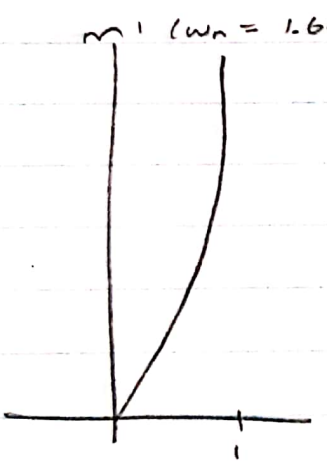
$$-\frac{k_2}{m_2} x_1 + \frac{k_2}{m_2} x_2 = 0$$

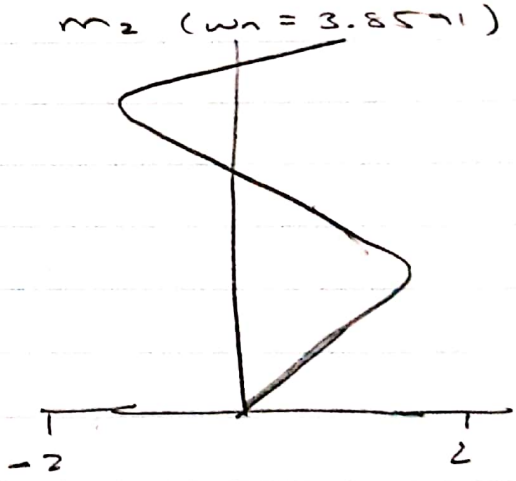
$$(450 - \omega_n^2) x_1 - 200 x_2 = 0$$

$$-240 x_1 + 240 x_2 = 0$$

Eigenvalues are 587.9506 and 102.0494

ω_n = 3.8591 1.6078





Assignment 6

Q3

a) Excel

b) Excel

c) $x = 120$ $\quad Y = 0.1504(120) + 0.9063$

$= 19.038$