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Courses » Introduction to Mechanical Vibration Announcements **Course** Ask a Question Progress



## Unit 7 - Week 6

### Course outline

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Week 7

### Week 6 Assignment

The due date for submitting this assignment has passed. **Due on 2018-03-21, 23:59 IST**  
As per our records you have not submitted this assignment.

This assignment contains 10 questions. Each question has individual marks.

1) When a two-degree-of-freedom system is subjected to a harmonic force, the system vibrates at the **1 point**

- frequency of applied force
- smaller natural frequency
- larger natural frequency
- none

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*frequency of applied force*

2) Find the natural frequencies of the following system for  $k_1 = k_2 = k_3 = k$ , and  $m_1 = m_2 = m$  **2 points**

- 
- $\omega_1 = \sqrt{k/m}, \omega_2 = \sqrt{3k/m}$
- 
- $\omega_1 = \sqrt{2k/m}, \omega_2 = \sqrt{3k/m}$
- 
- $\omega_1 = \sqrt{3k/m}, \omega_2 = \sqrt{2k/m}$
- 
- $\omega_1 = \sqrt{3k/2m}, \omega_2 = \sqrt{2k/m}$

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

$\omega_1 = \sqrt{k/m}, \omega_2 = \sqrt{3k/m}$

3) Using the figure of Q.02. Find the natural frequencies (rad/second) of the system shown in figure for  $m_1 = 2$  kg,  $m_2 = 5$  kg,  $k_1 = k_2 = 3$  N/m, and  $k_3 = 4$  N/m. **2 points**

- 
- $\omega_1 = 0.2, \omega_2 = 3.854$
- 
- $\omega_1 = 2.74, \omega_2 = 3.02$
-

Week 8

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$\omega_1 = 0.979, \omega_2 = 1.854$

$\omega_1 = 4.23, \omega_2 = 9.27$

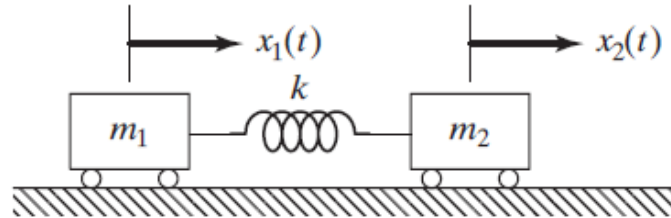
No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\omega_1 = 0.979, \omega_2 = 1.854$$

- 4) Find the natural frequency of the system as shown in the figure below for  $m_1 = 3 \text{ kg}$ ,  $m_2 = 6 \text{ kg}$ , and  $k = 250 \text{ N/m}$ . 3 points



- 
- $\omega_1 = 0, \omega_2 = 11.18$
- 
- 
- $\omega_1 = 0, \omega_2 = 9.57$
- 
- 
- $\omega_1 = 4, \omega_2 = 12.52$
- 
- 
- $\omega_1 = 0, \omega_2 = 17.32$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\omega_1 = 0, \omega_2 = 11.18$$

- 5) Using the figure of Q.4. Find the mode shape of the system 3 points

- 
- $X_1 = \begin{bmatrix} 1 \\ 1.5 \end{bmatrix}, X_2 = \begin{bmatrix} 1 \\ -0.78 \end{bmatrix}$
- 
- 
- $\begin{bmatrix} 1 \\ 1.5 \end{bmatrix}, X_2 = \begin{bmatrix} 1 \\ -0.51 \end{bmatrix}$
- 
- 
- $\begin{bmatrix} 1 \\ 0.86 \end{bmatrix}, X_2 = \begin{bmatrix} 1 \\ -0.78 \end{bmatrix}$
- 
- 
- $\begin{bmatrix} 1 \\ 1 \end{bmatrix}, X_2 = \begin{bmatrix} 1 \\ -0.87 \end{bmatrix}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\begin{bmatrix} 1 \\ 1 \end{bmatrix}, X_2 = \begin{bmatrix} 1 \\ -0.87 \end{bmatrix}$$

- 6) A machine tool, having a mass of 1000 kg and a mass moment of inertia of  $J_0 = 300 \text{ kg-m}^2$  is supported on elastic supports, as shown in Figure given below. If the stiffness of the support is given by 3000 N/mm and 2000 N/mm, and the supports are located at 0.5 m and 0.8 m, find the natural frequencies. 3 points



- $\omega_1 = 110, \omega_2 = 40.18$
- $\omega_1 = 50, \omega_2 = 39.57$
- $\omega_1 = 70.57, \omega_2 = 82.373$
- $\omega_1 = 0, \omega_2 = 85.32$

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

$\omega_1 = 70.57, \omega_2 = 82.373$

7) Using Q.6, find the mode shapes of the machine tool.

- $X_1 = \begin{bmatrix} 1 \\ 1.5 \end{bmatrix}, X_2 = \begin{bmatrix} 1 \\ -0.78 \end{bmatrix}$
- $X_1 = \begin{bmatrix} 1 \\ -5.34 \end{bmatrix}, X_2 = \begin{bmatrix} 1 \\ 0.056 \end{bmatrix}$
- $X_1 = \begin{bmatrix} 1 \\ 0.86 \end{bmatrix}, X_2 = \begin{bmatrix} 1 \\ -0.75 \end{bmatrix}$
- $X_1 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}, X_2 = \begin{bmatrix} 1 \\ -0.87 \end{bmatrix}$

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

$X_1 = \begin{bmatrix} 1 \\ -5.34 \end{bmatrix}, X_2 = \begin{bmatrix} 1 \\ 0.056 \end{bmatrix}$

8) Figure shows a vibrating system having two degree of freedom. The ratio of **3 points** amplitudes of the motion of  $m_1$  and  $m_2$  for the two mode of the vibration. Given:  $m_1 = 1.5 \text{ kg}$  and  $m_2 = 0.8 \text{ kg}$  and  $k_1 = k_2 = 40 \text{ N/m}$ .

- 0.765, 0.696
- 2.56, 0.456
- 6.450, 0.969
- 0.569, 4.547

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

$-0.765, 0.696$

9) In the system shown in the figure, the mass  $m_1$  is excited by a harmonic force **3 points**  $40\sin(4\pi t)$  N. Find the forced amplitude (in mm) of each mass for  $m_1 = 15 \text{ kg}$ ,  $m_2 = 10 \text{ kg}$ ,  $k_1 = 6000 \text{ N/m}$ , and  $k_2 = 1500 \text{ N/m}$ .

- $X_1 = 14.25, X_2 = 56.4$



3 points



- $X_1= 1.49, X_2=28.0$
- $X_1= 9.773, X_2= 16.148$
- $X_1= 12.148, X_2= 3.458$

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

$X_1= 1.49, X_2=28.0$

10) The mass and stiffness matrices and the mode shapes of a two-degree-of-freedom system are given by

0 points

- 12, 2.4, 1.581
- 24, 5.4, 2.58
- 28, 6, 8.5
- 17, 7, 3.5

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

$12, 2.4, 1.581$



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