Menoufiya University
Faculty of Engineering
Shebin EL-Kom

Dept :Prod.Eng.&Mech.Design

Menoufiya University
Faculty of Engineering
Shebin EL-Kom
Final First Term Examination
Academic Year:2014-2015
Date: 10/6/2015

Subject: Vibration of Machines
Code: PRE 617
Time Allowed: 3 hours
Total Marks:100 Marks

This exam measures ILOS no:(a_1,a_{13},b_2,b_6,b_{17},c_1,c_3)

Answer all the following Questions:

(Question1)

Give short account: (20marks)

Random signals in vibration using sketch and examples.

What is the function of power spectrum density?

The direct relationship between the input and output in block diagram.

(Question2) (20marks)

Explain types of vibration signals, and how can it be statistically calculated.

(Response of vibration carries much information's for mechanical system)

Explain this expression and discuss in detail:

Vibration control can be achieved by external damping.

(Question3) (10 marks)

-Compare between proportional damping and non proportional damping using examples and mathematical equations.

-Explain state-space method used in non proportional damping.

-Give an approximate formula governing the damping properties of a treated Panel in practice.

Problem 4): **(20 Marks)**

Determine the upper and Lower bounds of the fundamental frequency of the system shown in Fig.1 by using:

(c) Rayleigh,s method
(d) Dunkarly,s formula
(e) Bound method

Problem (5 : **(15 Marks)**

1- Express various forms types of Dunkarley,s on the multi-degree system.
2-Estimate the fundamental natural frequency of the beam shown in Fig.2
All data are given

Problem (6 : **(15 Marks)**

Find the eigenvalues and eigenvectors of the matrix using Jacobi method.

$$[D] = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 2 \\ 1 & 2 & 3 \end{bmatrix}$$

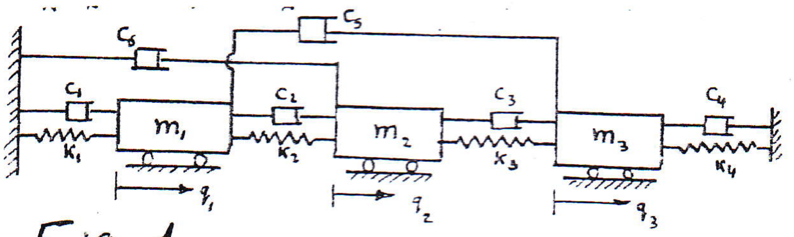

Fig. 1

Letting $m_1 = m_2 = m$ and $m_3 = 2m$, we obtain the inertia matrix

$$\underset{\sim}{m} = \begin{bmatrix} m_1 & 0 & 0 \\ 0 & m_2 & 0 \\ 0 & 0 & m_3 \end{bmatrix} = m \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2 \end{bmatrix}.$$

If $k_1 = k_2 = k_3 = k$ and $k_4 = 2k$, the stiffness matrix takes the form,

$$\underset{\sim}{k} = \begin{bmatrix} 2k & -k & 0 \\ -k & 2k & -k \\ 0 & -k & 3k \end{bmatrix} = k \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 3 \end{bmatrix}.$$

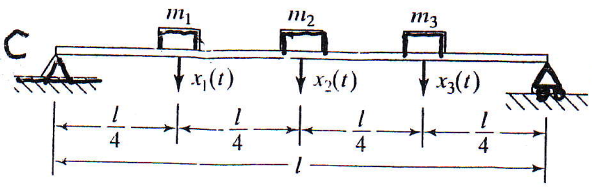

Fig. 2