Code No: 5215AF

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech I Semester Examinations, February - 2017

VIBRATION ANALYSIS OF MECHANICAL SYSTEMS

(Machine Design)

Time: 3hrs **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

5 × 5 Marks = 25

1.a) What is the difference between the damped and un damped vibrations? Explain. [5]
b) What is the importance of orthogonality principle of normal modes? [5]
c) What are the properties of Rayleigh's quotient? [5]
d) What is frequency domain of vibration analysis? [5]
e) Explain the difference between passive and active isolation. [5]

PART - B

5 × 10 Marks = 50

2.a) Find the time period of vibration of a compound pendulum.
b) A light cantilever of rectangular section (5cm deep by 2.5 cm) has a mass fixed at its free end. Find the ratio of the frequency of free lateral vibration in vertical plane to that in the horizontal plane. [10]

OR

3. A horizontal spring mass system with coulomb damping has a mass of 5.0 kg attached to a spring of stiffness 980 N/m. if the co-efficient of friction is 0.025, calculate:
a) The frequency of free oscillations
b) The no of cycles corresponding to the 50% reduction in amplitude if the initial amplitude is 5.0 cm
c) The time taken to achieve this 50% reduction. [10]

4. Determine the value of influence coefficients for the system shown in figure 1. [10]

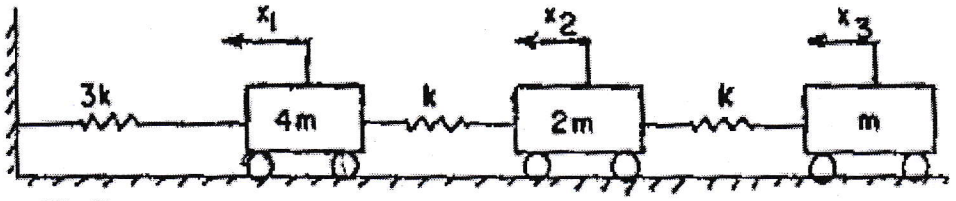

Figure: 1

OR

5. A bar is free at both ends and is initially stretched by static force P acting at the ends. The force are released instantaneously. Derive the frequency equation expression for natural frequencies, normal function and general series for free vibration. [10]

6. Use Holzer's method to determine the natural frequency of the system shown in Figure 2.

$J1 = 50$ kg cm-sec^2 $J2 = J4 = 2$kg-cm-sec^2 $J3 = 15$ kg-cm-sec^2

$Kt_1 = Kt_3 = 10 \times 10^6$ kg-cm/rad $Kt_2 = 20 \times 10^6$ kg-cm/rad. [10]

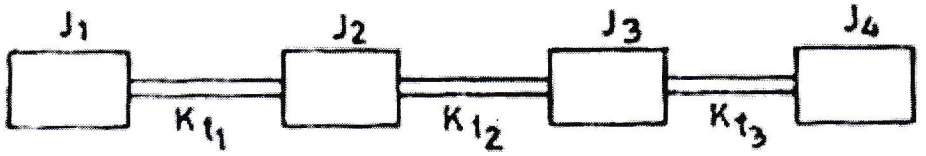

Figure: 2

OR

7. Determine the lowest natural frequencies of a given system shown in figure 3 using Rayleigh's method and Dunkerly's method.

m1=100kg m2=50kg $E = 1.96 \times 10^{11}$ N/m^2 $I = 4 \times 10^{-7}$ m^4 [10]

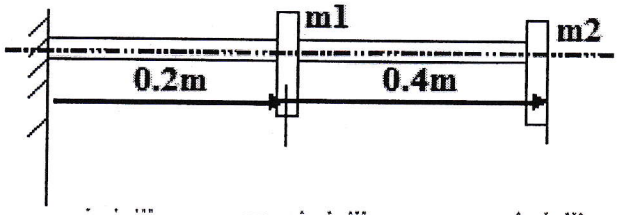

Figure: 3

8.a) What are the various conditioning monitoring techniques? Explain them.

b) Write a short note on the root cause analysis. [5+5]

OR

9. Describe the different types of vibration data acquisition systems. [10]

10.a) List out the basic principles of passive vibration control.

b) Explain the absorber and isolator along with dynamic properties of vibration absorber. [5+5]

OR

11. Write short notes on the:

a) Active vibration control methods

b) Semi active control of automotive. [5+5]

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