Hall Ticket No | | | | | | | | | | | Question Paper Code: BST004

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech II Semester End Examinations (Regular) - July, 2017

Regulation: IARE–R16

STRUCTURAL DYNAMICS

(Structural Engineering)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Classify the different types of vibrations in structural system. Explain with neat sketches. **[10M]**
   (b) Define the degrees of freedom and explain the types with example of singly storey and multi storey shear buildings. **[4M]**

(OR)

2. (a) Explain Simple Harmonic motion with vectorial representation. Also explain the examples of Simple Harmonic Motion. **[7M]**
   (b) Find the amplitude of the sum of the two harmonic motions, **[7M]**
   $x_1 = 3\cos(2t + 1^o)$; $x_2 = 4\cos(2t + 1.5^o)$;

UNIT – II

3. Determine the differential equation of a classical spring-mass system and its natural frequency by using **[14M]**
   i. D'Alembert's principle
   ii. Energy method
   iii. Rayleigh's method.

(OR)

4. A machine of 20 kg mass is mounted on a spring and dashpot (SDOF). The total spring stiffness is 10N/mm and the total damping is 0.15N/mm/s. If the system is initially at rest and a velocity of 100 mm/s is imparted to the mass, then determine **[14M]**
   i. Displacement and velocity of the mass as function of time
   ii. Displacement and velocity at time equal to one second.

UNIT – III

5. An undamped two DOF system shown in Figure 1 has mass m_1= m_2= m and stiffness k_1= k_2= k. Determine its frequencies and mode shapes. **[14M]**

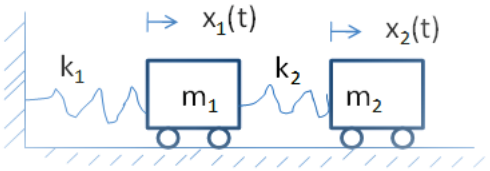

Figure 1

(OR)

6. (a) Explain the mode superposition methods to combine the modes in response spectra method of analysis. **[7M]**

   (b) Explain the orthogonality condition of mode shapes for multi degree freedom system.What is its significance in dynamic analysis. **[7M]**

UNIT – IV

7. Explain the iterative method of frequency of vibration of Multi-degree of freedom spring mass system using Holtzer method. **[14M]**

(OR)

8. Derive the first three natural frequency and mode shapes for cantilever beam by solving the governing differential equation of flexural vibrations for continuous systems. **[14M]**

UNIT – V

9. Derive the response of a Single-degree of freedom system due to base excitation by solving the governing differential equation of motion. **[14M]**

(OR)

10. Explain the IS code procedure for response of multi storey building to earthquake excitation using Response spectra method.

[14M]

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