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Question Paper Code: BST004



INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

M.Tech II Semester End Examinations (Supplementary) - January, 2018

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) Obtain the response in terms of displacement for a SDOF system subjected to Undamped forced vibration. [7M]
- (b) Explain [7M]
 - i. Vectorial representation simple harmonic motion.
 - ii. Oscillatory motion
2. (a) What are the types of dynamic loads? What are the uncertainties of dynamic analysis? [7M]
- (b) Define logarithmic decrement and obtain the expression for logarithmic decrement. [7M]

UNIT – II

3. (a) Obtain the equation of motion using D'Alembert's principle. [7M]
- (b) Obtain the expression for dynamic magnification factor for an under damped SDOF system subjected to harmonic load $F(t) = F_0 \sin \omega t$. [7M]
4. (a) Explain Duhamel integral method and write the expressions for displacement for damped and undamped condition using Duhamel integral. [7M]
- (b) Explain the necessity of mathematical modeling in structural dynamics and mention the objectives of dynamic analysis. [7M]

UNIT – III

5. (a) Differentiate with an example coupled and uncoupled equation of motion. [7M]
- (b) Derive the expression for orthogonality relationship between normal modes. [7M]

6. (a) Explain the concept of mathematical modeling of a multi degree of freedom system. [7M]
 (b) For the Figure 1, write the equation of motion and determine the natural frequencies and mode shapes. [7M]



Figure 1

UNIT – IV

7. (a) Explain the mode shapes of simple beams with different ends. [7M]
 (b) Analyze the undamped free vibration of beams in flexure. [7M]
8. (a) Derive the natural frequency and mode shape for simple supported beam. [7M]
 (b) For the multi storey building shown in Figure 2, obtain the natural frequencies and mode shapes using Stodolla's method. $M=10 \times 10^3 \text{ kgs}$ and $K=50 \times 10^6 \text{ N/m}$. [7M]

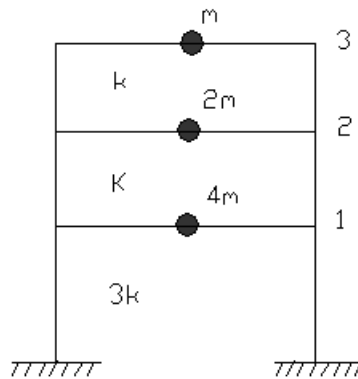


Figure 2

UNIT – V

9. (a) Explain the concept of excitation by rigid base translation for earthquake analysis. [7M]
 (b) Define transmissibility and derive the expression for it. [7M]
10. (a) Explain the lumped mass approach in MDOF systems. [7M]
 (b) Explain the procedure to find the lateral forces and storey shears in multi-storey building for dynamic analysis. [7M]

