Exam.Code:1015
Sub. Code: 7446

2054
M.E. (Mechanical Engineering)
Second Semester
MME-204: Structural Dynamics

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, selecting atleast two questions from each Part. Supplement your answer with suitable sketches wherever required. Assume any missing data suitably.

x-x-x

Part-A

1. Explain the differences between the FE route and experimental route of structural dynamics. Discuss their respective limitations and advantages. (10)
2. Discuss the significance of understanding structural dynamics in both the time domain and the frequency domain. Provide examples to illustrate your answer. (10)
3. Design a numerical example to demonstrate the application of Consstant acceleration step-by-step method in solving structural dynamic design problem. (10)
4. Design a critically-damped spring-mass-damper system with following constraints: Mass of the system can vary between 5 to 6 kg; Spring stiffness may be kept between 700 to 900 N/m. Also plot the response of the system in a graphical form. First natural frequency of the system should be as low as possible. (10)

Part-B

5. Describe the types of finite elements and types of loading commonly encountered in structural dynamics analysis. (10)
6. Finite element analysis (FEA) is widely used for structural dynamic analysis due to its versatility and accuracy. Discuss the challenges associated with modeling damping effects in FEA, particularly for nonlinear structures. Propose innovative approaches to address these challenges and improve the accuracy of dynamic simulations. (10)
7. Discuss the significance of orthogonality condition between normal modes in structural dynamic analysis. How is this condition utilized in practice? (10)
8. Utilizing MATLAB, conduct a comprehensive analysis of the flexural vibrations of a non-uniform beam with variable properties along its length. Consider different boundary conditions and loading configurations, and demonstrate how finite element modeling can capture the complex dynamic behavior of such structures. (10)

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