Reg. No. : | | | | | | | | | | |

Question Paper Code: 52631

M.E. DEGREE EXAMINATION, NOV 2016

Third Semester

Structural Engineering

15PSE301 – STRUCTURAL DYNAMICS

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The sudden falling of a heavy steel ball comes under the category of which type of load?

   (a) Sinusoidal Load (b) Random Load
   (c) Transient Load (d) Harmonic Load

2. The type of vibration which can happen in an unsymmetrical structure is

   (a) Shearing Vibration (b) Torsional Vibration
   (c) Axial Vibration (d) Flexural Vibration

3. Which of the following is not an application for the modal superposition method

   (a) 3D cable stayed bridge (b) A double layered 3D cable network
   (c) Un stiffened suspension bridge (d) A Portal frame

4. If the stiffness matrix is not diagonal, the structure is said to be

   (a) Dynamically coupled (b) Statically coupled
   (c) Both statically and dynamically coupled (d) None of these

5. The Newmark's β integration method is based on the assumption that the _____ varies linearly between two instants of time.

   (a) Displacement (b) Velocity
   (c) Acceleration (d) All the above

PART B - (5 x 3 = 15 Marks)

6. What is stiffness?

7. What is a shear building?

8. Write the uncoupled stiffness matrix.

9. Write the equation of motion of flexural beam subjected to free vibration.

10. How is dynamic equilibrium established?

PART C - (5 x 16 = 80 Marks)

11. (a) A delicate instrument is to be mounted on a factory floor using some suspension system. The floor is subjected to vibration amplitude of 3mm at 20Hz during normal usage. If the amplitude of vibration of the instrument is to be limited to 0.015mm for satisfactory operation. What is the required natural frequency of the instrument on its suspension? Assume damping as 5%. (16)

Or

(b) The roof of a one storey building has a weight of 10KN. All the columns supporting the roof together have a lateral stiffness of 24kN/m. The viscous damping coefficient is 500N/ (m/s). Estimate the natural period and natural frequency for both damped and undamped systems. (16)

12. (a) Explain the coulomb-damped free vibration with derivation. Also discuss practical applications of coulomb-damped free vibration. (16)

Or

(b) Write notes on any two of the following (a) Eigen value problem (b) Duhamel's Integral and (c) Critical Damping. (16)

13. (a) Write a short note on the SRSS method used in dynamic analysis of MDOF systems. (16)

Or

(b) To conduct a free vibration test on an empty elevated water tank, a cable is attached to the tank and a lateral horizontal force of 110KN is applied which pulls the tank horizontally by 50mm. The cable is suddenly cut and the resulting free vibration record indicates that at the end of 6 complete cycles, the time is 2 sec and the amplitude is 25mm. For this system determine: a) Lateral stiffness b) Damping ratio

c) Undamped natural period d) Damping co-efficient e) number of cycles and the time required for the displacement amplitude to decrease to 5mm. (16)

14. (a) Explain the Rayleigh's method of estimating fundamental frequency of continuous system and explain modifications made in Rayleigh Ritz approach. (16)

Or

(b) Find the fundamental frequency for a uniform, simply supported beam by assuming the static deflection curve. (16)

15. (a) Explain Wilson-Theta method. (16)

Or

(b) Write step by step numerical integration techniques. (16)

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