Register Number......................

M.E. DEGREE EXAMINATIONS: JANUARY-2009

First Semester

STRUCTURAL ENGINEERING

P07SE104 Structural Dynamics

Time: Three Hours

Maximum Marks: 100

Answer ALL Questions:-

PART A (20 x 1 = 20 Marks)

1. If the motion of the body is oscillating or reciprocating in character it is called
   _____

   a) Displacement   b) time   c) oscillation   d) vibration

2. If the external forces are considered to be operative during the vibratory motion of the body, such motion is referred to as _____

   a) Free vibration   b) time variation
   c) Forced vibration   d) Damped vibration

3. The minimum number of coordinate systems required to indicate the position of the mass at any instant is called _____

   a) Degree of freedom   b) Negative freedom system
   c) Forced freedom system   d) degree of system

4. Dynamic load is that in which magnitude, direction or position vary with _____

   a) Displacement   b) time   c) acceleration   d) forces

5. If there is rotational degree of freedom then the corresponding diagonal element in the mass matrix will be considered as _____
   a) zero   b) one   c) two   d) three

6. If the line of action of the force and displacement is orthogonal, the work done by the force is equal to _____

   a) zero   b) one   c) two   d) three

7. The damping force is equal to the product of the_____ and the co-efficient of friction

   a) normal force   b) actual force   c) point load   d)friction

8. _____ is to transform the simultaneous set of equation into an independent set of equation using modal matrix

   a) structure analysis   b)modal analysis   c) force analysis   d) nodal analysis

9. In the following methods which one is an approximate method to determine the fundamental frequency of a MDF system_____

a) Holzer method

b) Rayleigh's method

c) Stodola's method

d) Transverse matrix method

10. In Stiffness matrix and flexibility matrix contained of diagonal elements which is known as _____

a) Dynamic coupling

b) Static coupling

c) Principle coupling

d) Torsional coupling

11. For the free vibration of shear beam, the shape factor depends on the

a) Elasticity of the material

b) Cross sectional area

c) Shear force

d) Moment

12. The mass of moving load is _____ to the mass of beam.

a) Large   b) twice   c) small   d) half

13. If the mass of a system is considered to be distributed over its length, the mass is considered to have _____ degree of freedom.

a) Single   b) six   c) Two   d) infinite

14. In the continuous system the displacement at every point will require _____ number of co-ordinates.

a) 10   b) 25   c) 30   d) Infinite

15. In the initial derivation of free torsional vibration, the cross section of the bar is considered as _____

a) Rectangular   b) Circular   c) Square   d) None

16. In the free vibration of the shear beams the contribution of shear force towards the total deflection of the beam is _____

a) Negligible   b) Not negligible   c) Infinity   d) None

17. If an experiment is conducted a number of times, under identical conditions and the records obtained are always alike, then the process is termed as _____

a) Random   b) Deterministic   c) Dynamics   d) Continuous

18. Example for stationary random process.

a) Earthquake   b) wind generation   c) Both   d) None

19. In random process, the wave elevation at a given location is intended to be measured as a function of_____

a) Time   b) Displacement   c) Both   d) None

20. Random response of MDF system have _____ structures.

    a) Simple   b) Complex   c) Random   d) None

PART B (5 x 16 = 80 Marks)

21. a) i) State D'Alemberts principle. (4)

      ii) Derive the equation of motion using D'Alembert's principle. Also get the expression for all the vibratory parameters. (12)

(OR)

  b) i) Distinguish between free and forced vibration (4)

      ii) Derive the equation of the motion for a spring mass system without damping using any one method. (12)

22. a) i) What is damping and explain the various sources of damping ? (8)

      ii) Derive the equation of motion of MDF system (8)

(OR)

  b) i) Determine the natural frequencies and mode shapes of the system shown in the figure.1. by Holzer's method (8)

      ii) Explain the approximate method to determine the fundamental frequency of a MDF system. (8)

23. a). Explain the free flexural vibration of the simply supported beam

(OR)

  b) Derive the forced vibration of the shear beam under ground motion excitation.

24. a) i) Explain mode superposition solution for the response of undamped MDF system (10)

      ii) Explain dynamic response of structure (6)

(OR)

  b) i) State and explain orthogonality and normality of mode shapes (8)

      ii) Explain Dynamic coupling. (8)

25. a). i) Explain random variable (6)

      ii) Explain the two approaches of studying the response of a SDF system (10)

(OR)

b). i) Explain random processes . (6)

ii) Determine the mean square and the autocorrelation function for the random process X(t), whose spectral density is shown in figure.2. (10)
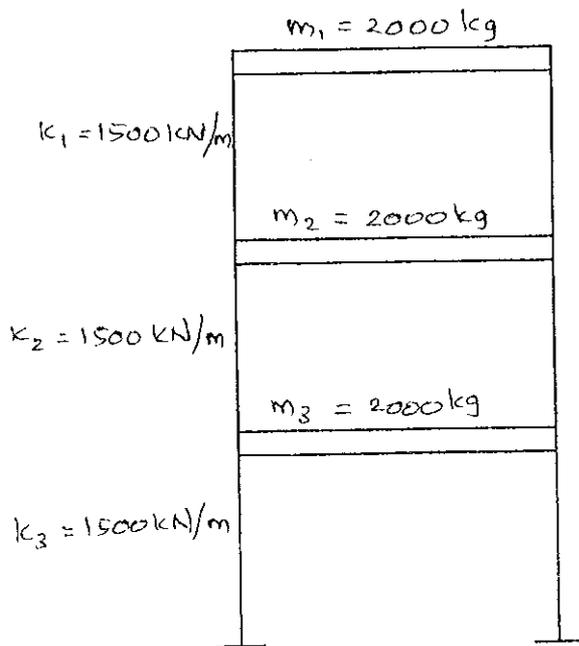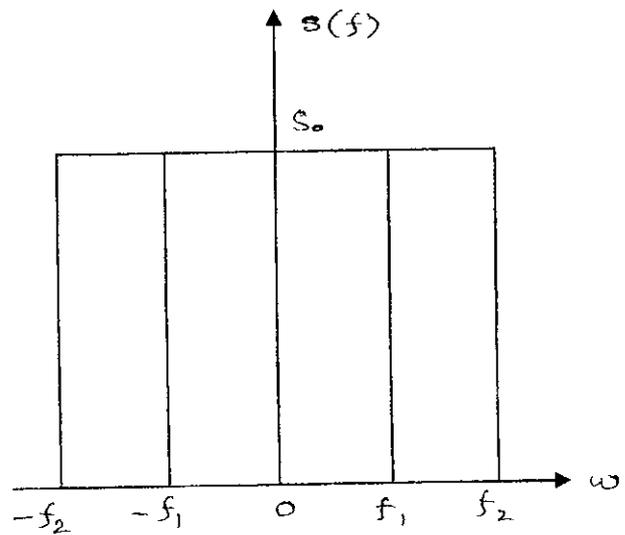

$m_1 = 2000 \, kg$

$k_1 = 1500 \, kN/m$

$m_2 = 2000 \, kg$

$k_2 = 1500 \, kN/m$

$m_3 = 2000 \, kg$

$k_3 = 1500 \, kN/m$

Figure 1

$S(f)$

S_o

$-f_2 \quad -f_1 \quad O \quad f_1 \quad f_2$

ω

Figure 2

****