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

Question Paper Code: 47104

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Seventh Semester

Civil Engineering

14UCE704 - STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING

(Note: Use of IS 13920:1993, IS 4326:1993 and IS 1893(Part 1):2002 are permitted in the End Semester Examinations)

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Unit of stiffness is **…….**

   (a) Kg-m/s^2 (b) N-s/m

   (c) N/m (d) N-s/m^2

2. Natural frequency of suspended frequency is

   (a) $\omega_n = \sqrt{\frac{k}{m}}$ (b) $\omega_n = \sqrt{\frac{m}{k}}$ (c) $\omega_n = \sqrt{\frac{1}{km}}$ (d) None of the above

3. The graphical representations of the relative amplitude of the two co – ordinates and their phase angle relationship is called as

   (a) Bending moment diagram (b) Moher's diagram

   (c) Mode shape diagram (d) Shear force diagram

4. The mode corresponding to the lowest frequency is called as

   (a) Fundamental mode (b) Third mode

   (c) Second mode (d) None of the above

5. The movements of plates towards each other and collide

(a) Divergent boundary (b) Convergent boundary

(c) Transform boundary (d) Plate boundary

6. For an ideal Rigid building, Time Period is

(a) greater than one (b) less than zero (c) greater than zero (d) equal to zero

7. ---------- is defined as the force required to produce unit deformation

(a) Natural Period (b) Stiffness (c) Frequency (d) Amplitude

8. The ratio between ultimate deformation to initial yielding

(a) Dilation factor (b) Moment distribution

(c) Ductility factor (d) Damping factor

9. ---------- is the resistance to the motion of a vibrating body.

(a) Period (b) Stiffness (c) Damping (d) Amplitude

10. Stress strain curve for a complete cycle of loading and unloading is known as

(a) pinching (b) bauschinger (c) hysteresis loop (d) none of these

PART - B (5 x 2 = 10 Marks)

11. What is mean by vibration?.

12. Explain the concept of Decoupling of equations.

13. What are the causes of Earthquake?

14. What is bouchinger effect?

15. What are the structural protective systems?

PART - C (5 x 16 = 80 Marks)

16. (a) Split the harmonic motion $x = 10 \sin (wt + 2r/6)$ into two harmonic motions one having phase angle of 0° and other having 45° phase angle. (16)

Or

(b) Find the natural frequency of the system as shown in Figure1.1. Take $k_1 = k_2 =$ 1500 N/m, $k_3 = 2000$ N/m and mass 'm' = 10kg. (16)

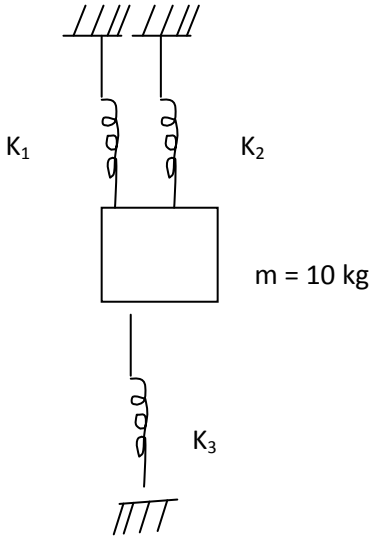
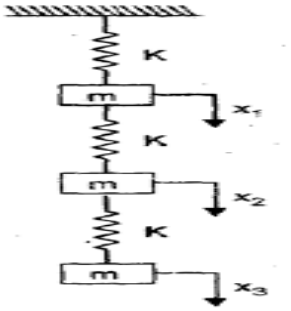


Figure : 1.1

17. (a) Determine the natural frequencies of the system shown in figure using matrix method.



(16)

Or

(b) An undammed single degree of freedom system (m = 30 kg, k = 500 N/m) is given an initial displacement of 10 mm and initial velocity of 75 mm/s. Find (16)

(a)The natural frequency

(b)The period of vibration

(c)The amplitude of motion

(d)The time at which the second and third maximum peak occurs.

18. (a) (i) How do scientists measure the size of earthquakes? (8)

(ii) What causes earthquakes and where do they happen? (8)

Or

(b) (i) Explain in detail about "Elastic Rebound Theory". (8)

(ii) Discuss the structural systems for RC buildings for carrying vertical loads and lateral loads with neat sketches. What is the most desirable configuration of lateral load resisting elements? (8)

19. (a) Explain the importance of ductility in earthquake resistant structures. (16)

Or

(b) (i) Explain design spectrum. And how it's differs from response spectra? (8)

(ii) Explain the concept of design? (8)

20. (a) Explain the salient features of earthquake resistance design and construction of building provisions as per IS 4326:1993 (16)

Or

(b) (i) Write note "Strong column – weak beam concept". (8)

(ii) Explain methods to determine the earthquake force in various members of building once the base shear has been determined. (8)