Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTER B.TECH DEGREE EXAMINATION (Regular), DECEMBER 2022

(2020 SCHEME)

Course Code : 20CET391

Course Name: Structural Dynamics

Max. Marks : 100 **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Explain Degrees of freedom with suitable examples.
2. Explain the physical importance of logarithmic decrement and define equation for the same
3. Write short note on active isolation?
4. Derive the Fourier series expression and write the expression for the steady state response of a SDOF system for the force function,

   $F(t) = F_0$,$0 \le t \le T_P/2$

   0, $T_P/2 \le t \le T_P$
5. Describe the concept of shear building frames.
6. State the orthogonality condition.
7. Describe in detail the concept of modal superposition method.
8. Illustrate the steps in the analysis of forced vibration of MDOF system.
9. Write short note on seismic waves.
10. What is earthquake response spectrum?

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Explain the salient features of frequency response curve of a damped SDOF system having harmonic excitation (7)

    b) Explain critically damped, over damped and under damped systems. (7)

OR

12. a) A platform of weight 20 kN is being supported by four equal columns which are clamped to the foundation as well as to the platform. A force of 10 kN applied horizontally to the platform produces a displacement of 5mm. Damping is in the order of 6% of critical damping. Determine undamped natural frequency, absolute damping present in the system, logarithmic decrement and number of cycles and the time required for the amplitude of motion to be reduced from an initial value of 5mm to 0.5mm (10)

b) Develop the mathematical model of a single degree of freedom system. (4)

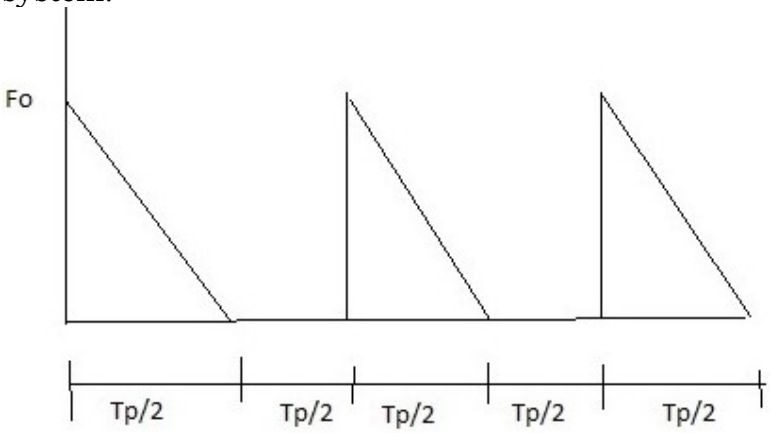
MODULE II

13. a) Derive the expression for steadystate response and DLF for a triangular impulse (10)

b) Comment on the importance of Transmissibility ratio (4)

OR

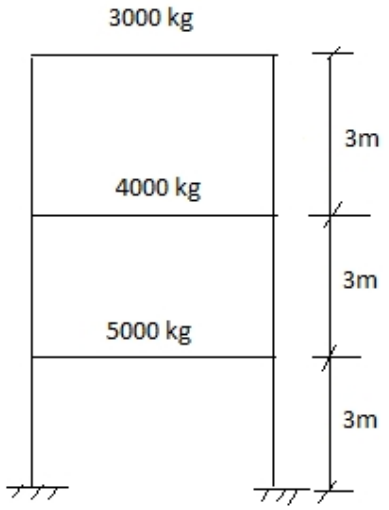
14. Derive the Fourier series expression for the given periodic loading and also write the expression for the steady state response of an SDOF system.



(14)

MODULE III

15. Calculate the natural frequency and mode shapes of vibration for the MDOF system shown in figure. EI = 4.5 x10^6 N-m^2 for all columns (14)



OR

16. Determine the natural frequency and mode shape for

$$[M] = \begin{Bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{Bmatrix} [K] = \begin{Bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{Bmatrix}$$ (14)

MODULE IV

17. Derive the characteristic equation of forced vibration of undamped system. (14)

OR

18. a) Write short note on the concept of frequency response function (FRF). (7)
    b) Define seismology. List out the causes of earthquake (7)

MODULE V

19. Determine the natural frequencies and mode shapes of a uniform thin slender rod having one end fixed and other end free. Plot the first three principle mode shapes. (14)

OR

20. a) Derive the differential equation of motion for the flexural vibration of beams. (8)
    b) Determine natural frequency and mode shape of simply supported beam by flexural vibration of beams (6)

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