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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION (R), DECEMBER 2023

CIVIL ENGINEERING

(2020 SCHEME)

Course Code: **20CET493**

Course Name: **Soil Dynamics and Machine Foundations**

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

PART A

(Answer all questions. Each question carries 3 marks)

1. Describe Single degree freedom system.
2. Compare and contrast over-damped system to under-damped system.
3. Compare and contrast linear elastic weightless spring method to elastic half space analysis.
4. Outline modes of vibrations of a rigid foundation block.
5. Describe frequency ratio.
6. Define operation frequency and Limiting Frequency.
7. Define coefficient of restitution.
8. Enumerate the requirements of cushion pad.
9. Describe “Transmissibility” in vibration isolation.
10. List the design procedure for foundation on absorbers.

PART B

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

MODULE I

11. Review dynamic soil properties and factors affecting them. (14)

OR

12. Explain block vibration test with necessary figures. (14)

MODULE II

13. A reciprocating machine is symmetrically mounted on a block of size 4 m x 3 m x 3.5 m. The soil is sandy with $\emptyset=35^0$ and γ_{sat} = 18 kN/m^3. The water table lies at a depth of 3.0 m below ground. Block is embedded in ground by 2.0 m depth. The machine vibrates at 250 rpm and generates a vertical unbalanced force of 2.5 kN and torque of 4.0 kNm about Z axis. The maximum horizontal unbalanced force 2.0 kN acts at a height of 0.2 m above the top of the block. Block (14)

vibration test gave a value of C_u = 3.62 × 10^7 kN/m^3, G = 1.10 × 10^4 kN/m^2, E = 2.98 × 10^4 kN/m^2 and μ = 0.35. Determine the natural frequency and amplitude by weightless spring method for coupled rocking and sliding. Assume any missing data.

OR

14. Distinguish 'coupled' and 'decoupled' vibratory modes of a foundation. Explain their relevance in dynamic analysis. (14)

MODULE III

15. a) The following data refer to a single cylinder reciprocating machine. Crank Radius 100 mm, Length of connecting rod 300 mm, operating speed 1500 rpm, weight of reciprocating part 45 N and weight of rotating part 9 N. Calculate maximum unbalanced force. (7)

    b) Explain design criteria for foundations of reciprocating machine as per IS 2974 P1-1982. (7)

OR

16. Illustrate the design procedure for foundations of reciprocating machines. (14)

MODULE IV

17. Illustrate the design criteria for foundation of impact type machines as per IS 2974 P2-1982. (14)

OR

18. Describe the special consideration in planning foundations for hammer type machines. (14)

MODULE V

19. Review vibration isolation in reference to IS 13301-1992. (14)

OR

20. a) Explain coil springs as a vibration isolator. (7)

    b) Explain cork pads as a vibration isolator. (7)

****