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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER M.TECH DEGREE EXAMINATION (Regular), DECEMBER 2022
GEOMECHANICS AND STRUCTURES
(2021 Scheme)

Course Code: **21GS105-D**

Course Name: **Earthquake Analysis and Design of Structures**

Max. Marks: **60** **Duration: 3 Hours**

IS:1893-2016, IS:13920-2016, SP:22 permitted

PART A

(Answer all questions. Each question carries 3 marks)

1. Differentiate between Magnitude and Intensity.
2. Explain the Earthquake resistant Design Philosophy.
3. What are the two seismic design requirements an engineer has to account for in the analysis of earthquake – resistant design of buildings? Discuss briefly how these are incorporated to achieve the objective.
4. Analyse the limitations of response spectrum analysis procedures.
5. Distinguish between ordinary moment resisting frame and special moment resisting frame.
6. Explain the significance of ductility in beam-column joints.
7. Illustrate the criteria to be met by building for effective base isolation.
8. Elaborate the uses of tuned mass dampers.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

9. Explain how measurement of ground motion is done by seismologists and design engineers. (6)

OR

10. a) Write a short note on seismic zoning. (3)
    b) Explain the steps of seismic hazard analysis? (3)

MODULE II

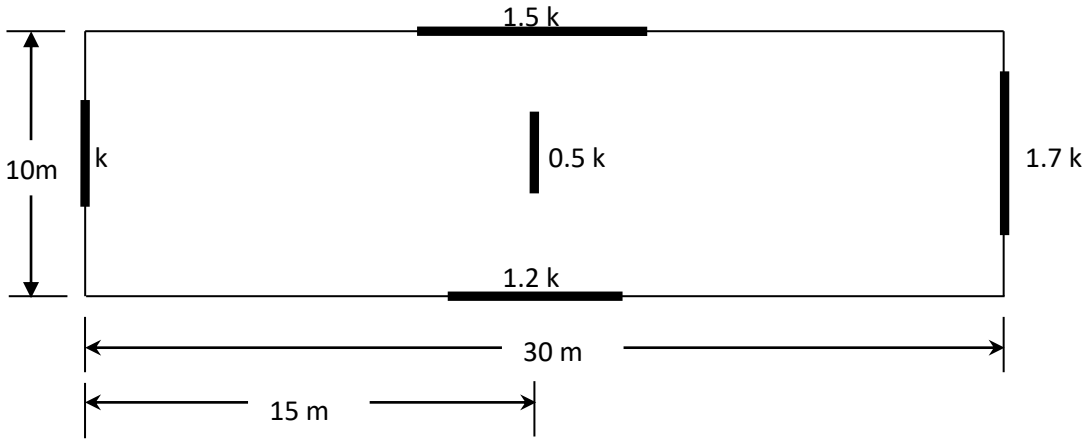
11. Explain the concept of response spectra? How it is constructed and compare it with design spectra. (6)

OR

12. Explain vertical and horizontal irregularities in multistoried buildings and their effect on seismic behavior, of such buildings. (6)

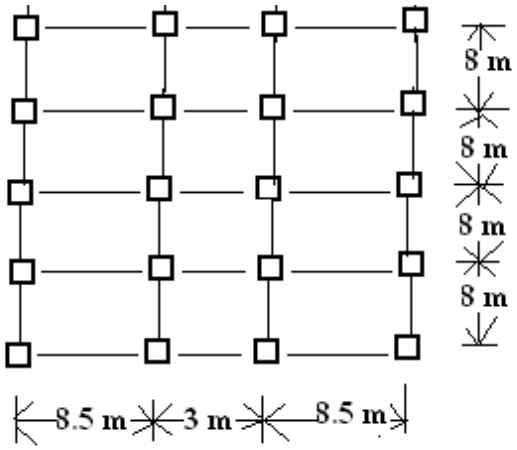
MODULE III

13. Calculate the lateral force in the walls using torsional provisions of code IS:1893 of the one storey building shown in figure due to lateral force of 180kN applied in x direction, 200kN applied in y direction. The roof diaphragm is rigid in its own plane and mass at the roof is uniformly distributed. (6)



OR

14. Plan of five storeyed building is shown below. Total dead load can be assumed as 5 kN/m^2 and live load as 4 kN/m^2 on each floor and as 1.5 kN/m^2 on the roof. Determine the lateral forces and shears at different storey levels. (6)
Assume, zone factor = 0.24, I = 1, response reduction factor,
R = 5, soil type = 2, storey height = 3.5m.



MODULE IV

15. Explain ductile detailing specifications for beam, column and beam – column joint as per IS:13920 (6)

OR

16. Design a rectangular beam for 8m span to support a DL of 10kN/m and a LL of 12kN/m inclusive of its own weight. Moment due to earthquake load is 100kN-m and shear force is 80kN. Use M20 grade concrete and Fe 415 steel. (6)

MODULE V

17. Design a shear wall for a 12 storey building for the following data. Storey shear at different levels are as follows: (6)

Storey no.	1	2	3	4	5	6	7	8	9	10	11	12
Storey shear(kN)	5	10	30	80	140	200	360	500	700	850	900	950

Storey height = 3.2m
Length of shear wall = 7.5m
Seismic weight of building = $60x10^3$kN
Axial load on shear wall = $3x10^3$kN
Building is situated in Mumbai.
Use M-20 grade concrete and Fe 415 steel.

OR

18. Explain the procedure for design of shear wall and ductile detailing. (6)

MODULE VI

19. Explain the principles and applications of base isolation in building. Illustrate with case studies. (6)

OR

20. Examine how vibration control techniques be applied for important structures? Give an example. (6)

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