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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER M.TECH DEGREE EXAMINATION (R,S), MAY 2024

GEOMECHANICS AND STRUCTURES

(2021 Scheme)

Course Code: 21GS201

Course Name: Design of Reinforced Concrete Foundations

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

Use of IS 456, SP 16 are permitted

PART A

(Answer all questions. Each question carries 3 marks)

1. Draw and explain the soil pressure distribution under Rigid and flexible footings.
2. Explain the situation under which combined footings are recommended.
3. Summarize the limitations of Direct design method (DDM) for mats.
4. Explain the IS codal provisions to classify the structure based on rigidity.
5. Briefly discuss the load transfer mechanism in a pile cap.
6. Draw and mark the components of well foundation.
7. List the advantages and disadvantages of shell foundations.
8. Discuss the advantages of annular rafts over full circular raft.

PART B

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

MODULE I

9. Design a rectangular footing for an axially loaded column of size 300×600 mm, load on column is 1300 kN. Safe bearing capacity of soil is 200 kN/m^2 .Use M25 concrete and Fe 415 steel. (6)

OR

10. A brick masonry wall 230 mm carries a load of 360 kN/m inclusive of its self weight. Design a RCC strip footing under wall, bearing capacity of soil is 150 kN/m^2 at 1 m depth. Use M20 concrete and Fe 415 steel. (6)

MODULE II

11. Two columns 500 mm x 500 mm are spaced at 5.0 m apart carrying a load of 1600 kN each. If the width restriction is 2.4 m and SBC of soil is 200 kN/m^2,design a combined footing, assume M25 concrete & Fe 415 steel. (6)

OR

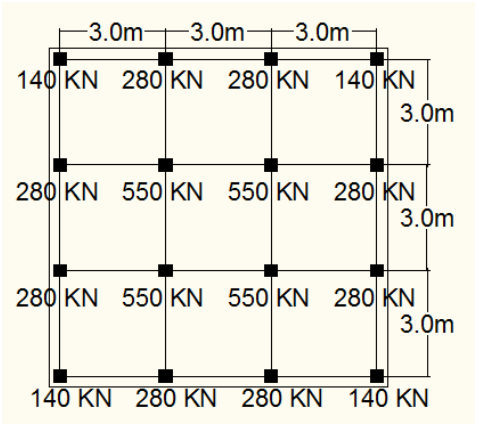
12. Design a strap footing for two columns C1 400 mm x 400 mm and C2 600 mm x 600 mm in size, carrying a factored load of 900 kN and 1500 kN respectively. The columns are spaced at 4.5 m centre to centre distance and The SBC of soil is 150 kN/m^2 . Use M20 concrete and Fe 415 steel. (6)

MODULE III

13. Design a cantilever retaining wall to retain earth embankment 4.0 m high above ground level. The density of earth is 18 kN/m^3 and angle of repose is 30^0. Safe bearing capacity of soil may be taken as 195 kN/m^2 and the coefficient of friction between soil and concrete is 0.65. Assume the embankment is horizontal at its top, adopt M20 concrete and Fe 415 steel. (6)

OR

14. Design a flat slab raft with edge beam for a layout of 16 columns as shown in the figure below. Assume columns are 300mm x 300 mm and enlarged to 600mm x 600mm at capital. Take safe bearing capacity from settlement considerations as 100 kN/m^2. Use M20 concrete and Fe 415 steel. (6)



MODULE IV

15. Discuss ACI method of analysis of beams on elastic foundation. (6)

OR

16. Explain Winkler model for analysis of beams on elastic foundation. (6)

MODULE V

17. Design a pile cap for a system of 3 piles of diameter 400 mm supporting a column 500 mm which is carrying a axial load of 600 kN, piles are placed at the vertex of a equilateral triangle of sides 1200 mm, adopt M20 concrete and Fe 415 steel. (6)

OR

18. Explain the design steps of a under reamed pile. (6)

MODULE VI

19. A circular water tank is supported by 6 columns resting on annular raft. Total load from tank is 36000 kN. Design the ring beam assuming mean radius from centers of column line is 9.0 m. Adopt M20 concrete and Fe 415 steel. (6)

OR

20. a) Explain the advantages and disadvantages of shell foundation. (3)
    b) Discuss the different types of shell foundations with neat sketch. (3)

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