Register No.: …… Name: ……..

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER M.TECH DEGREE EXAMINATION (S), JULY 2022

GEOMECHANICS AND STRUCTURES

(2020 Scheme)

Course Code: **20CEGST102**

Course Name: **Design of Reinforced Concrete Foundations**

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

Use of IS 456 and SP16 are permitted.

PART A

(Answer all questions. Each question carries 3 marks)

1. What is the difference between a shallow and deep foundation? Give examples for each.
2. When do we provide a combined footing? How will you determine the shape of the combined footing?
3. List the types of rafts with figures.
4. Differentiate between a rigid and flexible foundation.
5. Explain the mechanism of failure of short and long piles when the top is a) restrained and b) unrestrained.
6. Which are the two design approaches for the design of pile caps involving two or more piles?
7. How will you check the stability of chimney foundations against overturning?
8. What are the forces acting on an annular raft foundation for chimneys?

PART B

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

MODULE I

9. Determine the thickness and reinforcement required for an isolated square footing of size 400mm × 400mm. Safe bearing capacity of soil is 250kN/m^2. Service load on the column is 1500 kN. Use M20 concrete and Fe415 steel. (6)

OR

10. Design a pedestal for a column of size 450mm x 450mm carrying a load of 1160 kN. Soil has a bearing capacity of 260 kN/m^2. (6)

MODULE II

11. Design a reinforced concrete rectangular combined footing for two columns A and B located 3.6 meters apart. The sizes of the columns are 400mm × 400mm and 600mm × (6)

600mm and the loads on them are 1000kN and 1500kN respectively. The projections of footing beyond the axis of the columns A are limited to 590mm. The bearing capacity of the soil is 240 kN/m^2 . Use M25 concrete and Fe415 steel.

OR

12. Two columns of size 300mm × 300mm each spaced 4m apart carries a service load of 450kN and 600kN. The safe bearing capacity of soil is 150kN/m^2. Design a strap footing for the columns as there are site boundary constraints. Use M25 concrete and Fe500 steel. (6)

MODULE III

13. Design a cantilever retaining wall to retain a soil of height 5.5 m. Soil has a density of 16 kN/m^3 and an angle of repose of 30°. SBC of soil is 210 kN/m^2. Use M25 concrete and Fe415 steel. (6)

OR

14. Design a raft footing for a layout of 9 columns with a 1.2m wide apron. The columns are arranged in 3 rows 4.5m apart. There are 3 columns in each row spaced 4m apart. Columns in corners carry 1000kN each and those on sides carry 1700kN each. The central column carries 2500kN. Take the allowable bearing capacity of soil as 100kPa. Assume column size as 300mm × 500mm. (6)

MODULE IV

15. Explain Winkler model analysis as plates or beams on elastic foundations. (6)

OR

16. Explain the procedure for analysis of flexible plate on elastic foundations using ACI method. (6)

MODULE V

17. Design a bored cast-in-situ pile of capacity 700 kN using M25 concrete and Fe415 steel. (6)

OR

18. A reinforced concrete column 500mm × 500mm carrying a load of 750kN is supported on three piles 300mm × 300mm in section. The centre to centre distance between the piles is 1500mm. Design the pile cap and sketch the details of reinforcements. Adopt M20 concrete and Fe415 steel. (6)

MODULE VI

19. Design a circular raft foundation for a cylindrical chimney of height 85m and external diameter 5m located where the wind intensity is 1 kN/m^2. SBC of soil is 180 kPa. (6)

OR

20 Design a conical shell foundation for a 400mm diameter column carrying load of 1100kN if the safe bearing capacity of soil is 75 kN/m^2. (6)

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