Register No.: …… Name: ……..

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

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

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. Discuss the basic design principle of strap footing.
3. List the conditions under which raft foundations are recommended.
4. Discuss the different methods of analysis of beams on elastic foundation.
5. Briefly explain the different types of steel column bases.
6. Explain the load transfer mechanism in under reamed piles.
7. List the advantages and disadvantages of shell foundations.
8. Discuss the various forces developed in conical shell foundations.

PART B

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

MODULE I

9. Design a rectangular footing for a axially loaded column of size 300×600 mm, load on column is 1150 kN. Safe bearing capacity of soil is 200 kN/m^2. Use M25 concrete and Fe415 steel. (6)

OR

10. A brick masonry wall 230 mm carries a load of 370 kN/m inclusive of its self-weight. Design RCC strip footing under wall take bearing capacity of soil 150 kN/m^2 under 1m depth. Use M20 concrete and Fe415 steel. (6)

MODULE II

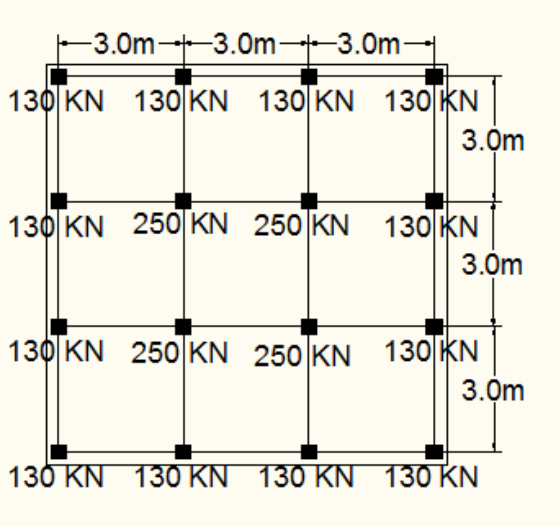
11. Design a combined footing for two columns C1, C2 400 mm x 400 mm and 500 mm x 500 mm in size carrying 500 kN and 800 kN of loads respectively. The smaller column is 0.4 m away from property line. The columns are spaced 4m apart and take bearing capacity of soil as 140 kN/m^2. Use M20 concrete and Fe415 steel. (6)

OR

12. Design a strap footing for two columns C1 and C2 400 mm x 400 mm and 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 . UseM 20 concrete and Fe415 steel. (6)

MODULE III

13. Design a flat slab raft with edge beam for a layout of 16 columns as shown below, the outer columns carry a load of 130 kN each, inner columns carry a load of 250 kN each. Assume columns are 300mm x 300 mm and enlarged to 600mm x 600mm at capital. Take safe bearing capacity from settlement considerations as 50kN/m^2 .Use M30 concrete and Fe415 steel. (6)



OR

14. Design a cantilever retaining wall to retain earth embankment 4.5 m high above ground level. The density of earth is 18 kN/m^3 and angle of repose is 30 degrees. Safe bearing capacity of soil may be taken as 200 kN/m^2 and the coefficient of friction between soil and concrete is 0.5. Assume the embankment is horizontal at its top, adopt M20 concrete and Fe415 steel. (6)

MODULE IV

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

OR

16. Discuss ACI method of 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 Fe415 steel. (6)

OR

18. The foundation for a structure consists of 10 piles to carry a load of 6000 kN. The piles are spaced 1.5 m centers. They are driven through a hard stratum available at a (6)

depth of 6 m. Design one of the piles and sketch the details of reinforcements. Adopt M20 concrete and Fe415 HYSD bars.

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 8.5 m. adopt M20 concrete and Fe 415 steel. (6)

OR

20. Explain the design procedure of a conical shell foundation. (6)

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