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: **21GS202**

Course Name: **Foundation Analysis and Design**

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

Assume missing data if any

PART A

(Answer all questions. Each question carries 3 marks)

1. Differentiate between general shear failure, local shear failure and punching shear failure.
2. When cantilever footing is provided? Also mention the precautions to be taken during construction of strap footings.
3. How settlement of a single pile can be estimated?
4. What is negative skin friction of piles?
5. How the axial load capacity of under reamed piles is arrived?
6. Explain the load transferring in laterally loaded piles.
7. What is modulus of subgrade reaction of soil?
8. When be the behaviour of a footing can considered as rigid?

PART B

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

MODULE I

9. a) Explain the significance of pressure bulb when designing a shallow foundation. (3)
   b) Find the immediate settlement below an isolated column footing size of 2.0 m × 3.0 m resting at 1.0 m depth on sand layer with N value around 30. Transferred column load = 1200 kN. (3)

OR

10 Design a strip footing carrying a vertical load of 600 kN/m resting at a depth of 1.5 m below the ground surface. Ground water table is located at a depth 2.0 m below the GL. The properties of the foundation soil are: γ = 18 kN/m^3, γ_{sat} = 21.81 kN/m^3. c' = 22 kPa, and φ' = 30°. (6)

MODULE II

11. Proportion a combined footing for the two square columns spaced at 4.8 m centre to centre. Total load transferred by the columns are 1200 kN and 1600 kN, respectively. Both columns having 400 mm width. The column transferring load of 1200 kN is (6)

abutting the property line. The allowable bearing pressure is 150 kPa.

OR

12. Discuss Winkler's hypothesis for analysis of mat foundation (6)

MODULE III

13. Find the axial capacity of a 10 m long 600 mm diameter concrete bored cast in situ pile in a uniform deposit of sand having angle of internal friction 35^0. The water table can rise to ground level. The saturated unit weight of sand is 19.81 kN/m^3. Take N_q= 48, calculate the safe load capacity of the pile with a factor of safety of 2.5. (6)

OR

14. Explain the method for finding ultimate pile load capacity using wave equation. (6)

MODULE IV

15. a) Explain static pile load test as per Indian standard to determine the axial capacity of piles. (4)
    b) What are the points to be considered in the design of spacing of piles in pile groups? (2)

OR

16. A group of 16 friction piles of 400 mm diameter arranged in square pattern in clay is subjected to a net load of 3000 kN. Depth of piles is 12.0m. Clay layer has a void ratio of 0.96 and compression index of 0.24. Saturated unit weight of soil is 15.81 kN/$m^{3.}$ There is hard rock at 20.0m depth. Estimate the consolidation settlement. (6)

MODULE V

17. A circular pile of 1.0 m diameter installed in sand layer having unit weight of 19 kN/m^3. Length of pile is 4.0 m. The concrete has a modulus of elasticity of 22 GPa. Load is acting at 0.2 m above the ground level. Coefficient of soil modulus variation is 30000 kPa/m. Calculate the lateral capacity of the pile. Angle of internal friction of soil is 30°. (6)

OR

18. Explain the IS code method to find the deflection and moments on long elastic piles. (6)

MODULE VI

19. Explain contact pressure distribution under a rigid footing in sand and clay. Also discuss about the settlements in each case. (6)

OR

20. Explain contact pressure theory using sub grade modulus reaction. (6)

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