

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER M.TECH DEGREE EXAMINATION (Regular), MAY 2023**GEOMECHANICS AND STRUCTURES****(2021 Scheme)****Course Code: 21GS202****Course Name: Foundation Analysis and Design****Max. Marks: 60****Duration: 3 Hours*****Use of IS 2911 P1 1980 is permitted*****PART A*****(Answer all questions. Each question carries 3 marks)***

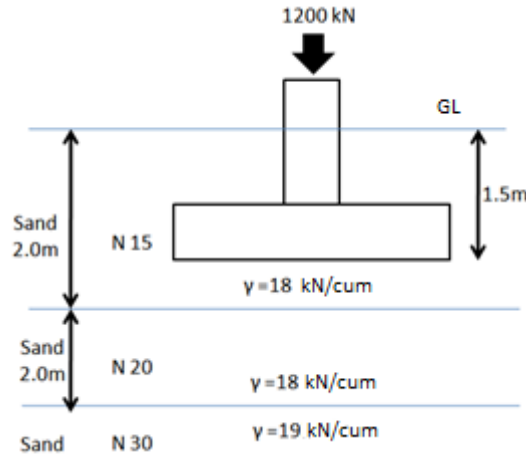
1. Explain IS Code method of bearing capacity analysis of shallow foundation.
2. What are the reasons for providing mat foundation?
3. Explain the classification of piles.
4. Explain Negative skin friction.
5. Explain PY curve method.
6. Explain behavior of under reamed piles under lateral loads.
7. Sketch contact pressure distribution beneath rigid footing and flexible footing.
8. Explain the importance of soil structure interaction in foundation analysis.

PART B***(Answer one full question from each module, each question carries 6 marks)*****MODULE I**

9. a) A strip footing of width 2m is founded at a depth of 1.5m below the ground surface in a soil having cohesion 30kPa and angle of internal friction 34° . The ground water is situated at a depth of 3.5m below the ground level. The moist unit weight of soil above water table is 17.25 kN/m³. Determine the allowable load per meter. (4)
- b) Describe the importance of pressure bulb distribution in settlement analysis of shallow foundation. (2)

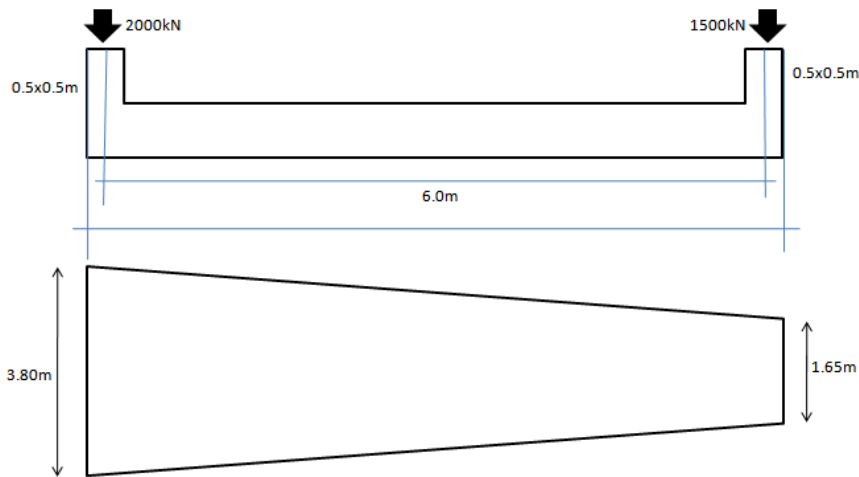
OR

10. Find the immediate settlement of a column footing 2x4m resting at 1.5m depth on a sandy soil. Soil profile and SPT values are given in the figure. (6)
 Consider a design period of 25 years. Plot influence diagram too.



MODULE II

11. Design a trapezoidal footing. Assume SBC = 200 kN/m². (6)



OR

12. a) Explain Winkler model. (4)
 b) What are design principles of strap footing (2)

MODULE III

13. a) Explain dynamic analysis of pile using wave equation. (4)
 b) Explain the concept of critical depth. (2)

OR

14. Estimate the allowable pile capacity by 1) Hiley's Formula and 2) Janbu's formula (6)
- Weight of hammer = 12 T
 Hammer efficiency = 0.78
 Energy rating of hammer = 60 kNm
 Pile diameter = 50cm
 Pile length = 12m
 $E_p = 200000$ MPa
 Pile undergoes a settlement of 300mm in last 15 blows
 P_u as per pile load test = 1360 kN
 $k_1 = 3.5$ mm $k_2 = 2.5$ mm
 Coefficient of restitution = 0.5

MODULE IV

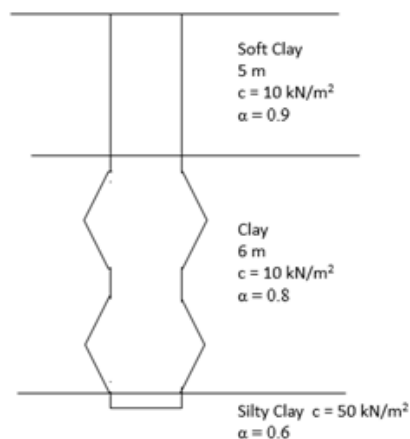
15. a) Discuss considerations of pile spacing in pile groups. (3)
 b) Calculate the group efficiency of piles using Field rule equation. (3)
 Diameter of pile is 40cm. Center to center spacing between piles is 2.5D. 24 piles are arranged with 6 piles in each row.

OR

16. A group of 9 piles with 3 piles in each row, were driven into soft clay from ground level to a great depth. Diameter and length of piles were 30cm and 10m respectively. The UCC strength of clay is 70kPa. If the piles were spaced at 90cm center to center, compute the allowable load considering a FOS of 2.5. (6)

MODULE V

17. Find the axial load capacity of double bulbed under reamed pile of 50cm stem diameter as shown in the figure. Take bulb diameter as 2.5 times stem diameter and select center to center distance between the bulb 1.25 times diameter of bulb.



(6)

OR

18. Discuss about the responses of pile when it is subjected to lateral load. (6)

MODULE VI

19. Explain concept of 'Contact Pressure Theory'. (6)

OR

20. Explain factors influencing modulus of sub grade reaction. (6)
