C   **538A2**   Total Pages:**3**

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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTER B.TECH DEGREE EXAMINATION (S**),** FEBRUARY
2023 **CIVIL ENGINEERING**

(2020 SCHEME)

Course Code: 20CET305

Course Name: Geotechnical Engineering – II

Max. Marks: 100   **Duration: 3 Hours**

PART A
(Answer all questions. Each question carries 3 marks)

1. Differentiate Rankine's and Coulomb's theories of earth pressure.
2. Elucidate the functions of a foundation. Also, differentiate shallow and deep foundations.
3. Explain (i) Ultimate bearing capacity, (ii) Safe bearing capacity, and (iii) Allowable soil pressure.
4. Discuss the effect of water table on the bearing capacity of soils.
5. Identify the causes of settlement of soils. Also, suggest any two remedial measures against settlement.
6. Explain the concept of floating foundations.
7. Discuss the effect of negative skin friction on pile foundations.
8. Illustrate the elements of a well foundation with the help of a neat sketch.
9. Explain the IS guidelines for choosing the depth and spacing of boreholes.
10. Discuss the corrections applied for the N-value in the Standard Penetration Test.

PART B
(Answer one full question from each module, each question carries 14marks)

MODULE I

11. a) Discuss the concept of the critical depth of a vertical cut.   (4)
    b) A 5m high retaining wall supports a soil of bulk unit weight (10)
    $18kN/m^3$, Angle of internal friction 30˚, and Cohesion $7kN/m^2$.
    Determine the Rankine's active earth pressure on the wall,
       i. Before the formation of tension crack.
       ii. After the formation of tension crack

OR

12. a) With the help of neat sketches, differentiate active and passive (4) earth pressures.

b)   A smooth backed vertical wall is 7 m high and retains a soil with (10)
a bulk unit weight of 18 kN/m^3 and φ = 20°. The top of the soil
is level with the top of the wall and is horizontal. If the soil
surface carries a uniformly distributed load of 5 kN/m^2,
determine the total active thrust on the wall per lineal meter of
the wall and its point of application.

MODULE II

13.   a)   Differentiate various shear failures with neat sketches.   (6)
       b)   Compute the ultimate bearing capacity of a circular footing of 1   (8)
m diameter resting on the surface of a saturated clay of
unconfined compression strength of 100 kN/m^2. Also compute
the safe bearing capacity if the factor of safety is 3.

OR

14.   a)   List the assumptions of Terzaghi's theory of bearing capacity.   (4)
       b)   Determine the net ultimate bearing capacity of a square footing (10)
of size 2 m, laid at a depth of 1.3 m below the ground surface, if;
     i.   the water table rises to the level of the base,
     ii.   the water table rises to the ground surface, and
    iii.   the water table is 1 m below the base.
Take γ = 20 kN/m^3, φ = 30°, and c' = 0.

MODULE III

15.   a)   Explain plate load test and its limitations.   (7)
       b)   A 30cm plate settles by 18 mm in a plate load test conducted on   (7)
a granular soil when load intensity was 200 kN/m^2. Estimate
the likely settlement in a footing 1.5m square, resting on the
same soil.

OR

16.   a)   Explain the conventional design procedure of a rigid mat   (6)
foundation.
       b)   Design a rectangular combined footing to support two adjacent   (8)
columns of size 40 cm x 40 cm at a distance of 5m and carrying
loads of 3 MN and 4 MN. The lighter column is near the property
line. The allowable soil pressure is 250 kN/m^2.

MODULE IV

17.   a)   Explain how the bearing capacity of single pile is determined in   (6)
clay and sand.
       b)   Design a friction pile group to carry a load of 3000 kN in a clay   (8)
strata of 20 m depth underlain by rock. The unconfined
compressive strength of the soil is 80 kN/m^2. Take factor of
safety value as 2.5.

OR

18. a) Discuss the methods to rectify the tilts and shifts of well foundations. (8)

  b) A pile is driven in a uniform clay of large depth. The clay has an unconfined compression strength of 90 kN/m². The pile is 30 cm diameter and 6 m long. Determine the safe frictional resistance of the pile, assuming a factor of safety of 3. Assume the adhesion factor α = 0.70. (6)

MODULE V

19. a) Explain any two geophysical methods used for soil exploration. (6)

  b) Explain Standard penetration test. Also explain the corrections required for N value. (8)

OR

20. a) Discuss the objectives of site investigation. (6)

  b) Discuss any two boring methods used in soil exploration with neat sketches. (8)

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