B,Tech. Evening (CIVIL ENGG) III YEAR V SEMESTER

END SEMESTER SUPPLEMENTRY EXAMINATION *FEB 2019*

CE-303 GEOTECHNICAL ENGINEERING

Time: 3 Hours *Max. Marks : 40*

Note: Answer all questions of equal marks. Assume suitable missing data, if any.

1. Attempt all of the following questions:

(a) What are the assumptions of Rankine's theory of earth pressure. (2)

(b)) What are the assumptions of Terzaghi's theory of bearing capacity. (2)

(c) With neat sketches differentiate combined footing and strap footing. (2)

(d) What is negative skin friction. (2)

2. Attempt any Two questions out of the following:

(a) The observed SPT value of in fully submersed sand was 45 at a depth of 6.0 m. The average effective unit weight of the soil is 19.2 kN/m^3.The other given data are (i) hammer efficiency=0.78 (ii) drill rod length correction factor=0.88 and (iii) bore hole correction factor=1.04. Determine the corrected SPT value for standard energy of 60% and estimate the relative density and angle of internal friction. (4)

(b) The results of two plate load tests are given in the following table:

Plate Size	Total Load	Settlement
45 cm × 45 cm	70.1 kN	12 mm
75 cm × 75 cm	150.1 kN	12 mm

If a square footing 1.5 m × 1.5 m is to be constructed and the allowable settlement is 12 mm, what is the magnitude of the total load that it can carry. (4)

(c) What are the purposes of soil investigation. Explain how the depth and spacing of bore holes are decided. (4)

3. Attempt any Two questions out of the following:

(a) A cantilever sheet pile is to retain 4.5 m of sand. The water table is at 0.5 m from the top of the backfill. Draw the net pressure distribution and find the depth of penetration for a factor of safety 1.5.The bulk and submersed unit weight of sand are 19.5 kN/m^3 and 12.5 kN/m^3 respectively. The coefficients of earth pressure in active and passive conditions are 0.33 and 3.3 respectively (4)

(b) A vertical retaining wall 8m high supports a cohesionless soil with bulk density 18.5 kN/m^3.The upper surface of the backfill rises from the crust of wall at an angle of 15^0 with

PTO

the horizontal. Determine the total active earth pressure by graphical method. Assume angle of shearing resistance as 36^0 and angle of wall friction as 17^0. (4)

(c) The stability analysis by Swedish circle method gave following values per unit length for a 8m high embankment-

Total shearing force = 600 kN, Total normal force = 1900 kN, Total neutral force = 250 kN

and Length of arc =26 m

The shear parameters of the soil are: C= 22 kN/m^2 and angle of shearing resistance = 8^0. Determine the factor of safety with respect to shear. (4)

4. Attempt any Two questions out of the following:

(a) Differentiate amongst general, local and punching shear failures. Explain how non dimensional bearing capacity factors are estimated for local shear failure. (4)

(b) A circular footing 2.5m diameter is founded at a depth of 2m below ground level in a loose soil deposit having following properties-

Bulk density of the soil =18.50 kN/m^3, cohesion=17.0 kN/m^2 and angle of shearing resistance = 20^0. The non dimensional bearing capacity factors are N_c = 17.7, N_q= 7.4 and N_γ = 5.0. Determine the safe bearing capacity. What will be the percentage reduction in bearing capacity if water table is at the foundation level. (4)

(c) What is group efficiency of piles. A group of nine piles, 16 m long and 0.25 m in diameter is to be arranged in a square form in a clayey soil with an average undrained cohesion of 24 kN/m^2 Determine the centre to centre spacing of piles for a group efficiency factor of one. The end bearing of the piles may be ignored. Assume adhesion factor as 0.85. (4)

5. Attempt any Two questions out of the following:

(a) How the stability of well foundation is checked. (4)

(b Explain forced vibration with equations. What are the types of machine foundations. Mention the coefficients used for the design of machine foundation. (4)

(c) What is expansive soil. Explain free swell and differential swell tests. (4)