Total No. of printed pages = 8

CE 131703

Roll No. of candidate | | | | | | | | | | |

2017

B.Tech. 7th Semester End-Term Examination

Civil

GEOTECHNICAL ENGINEERING – II

Full Marks – 100 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question no.1 and any six from the rest

1. Choose the correct answer from the given options for the following questions : $(10 \times 1 = 10)$

   (a) Bearing capacity of soil strata supporting a footing of size 3m × 3 m will not be affected by the presence of water table located at a depth which is

   (i) 1.0 m below the base of the footing.

   (ii) 1.5 m below the base of the footing.

   (iii) 2.5 m below the base of the footing.

   (iv) 3.0 m below the base of the footing.

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(b) A concentrated load of 50 ton acts vertically at a point on the soil surface. If Boussinesq's equation is applied for computation of stress, then the ratio of vertical stresses at depths 3m and 5 m respectively vertically below the point of application of load will be

(i) 0.36

(ii) 0.60

(iii) 1.66

(iv) 2.77

(c) If the actual observed value of Standard penetration resistance, N, is greater than 15 in a fine sand layer below water table, then the equivalent penetration resistance will be

(i) $15+\frac{N+15}{2}$

(ii) $15-\frac{N+15}{2}$

(iii) $15+\frac{N-15}{2}$

(iv) $15+\frac{15-N}{2}$

(d) Minimum center to center spacing of friction piles of diameter (D) as per BIS code is

(i) 1.5D

(ii) 2D

(iii) 2.5D

(iv) 3D

(e) In a Newmarks's influence chart for stress distribution, there are 10 concentric circles and 50 radial lines. The influence factor of the chart is

(i) 0.0002

(ii) 0.002

(iii) 0.02

(iv) 0.2

(f) If two foundations, one narrow and another wide, are resting on a bed of sand carrying the same load per unit area, then which one is likely to fail early?

(i) Narrow foundation.

(ii) Wider foundation.

(iii) Both will fail simultaneously.

(iv) Difficult to judge since other conditions are unknown.

(g) As per BIS code, the minimum depth of well foundation should not be less than

(i) 2 times the deepest scour below HFL.

(ii) 1.5 times the deepest scour below HFL.

(iii) 1.33 times the deepest scour below HFL.

(iv) 0.5 times the deepest scour below HFL.

(h) If the coefficient of active earth pressure is 1/3, then what is the value of coefficient of passive earth pressure?

(i) 1/9

(ii) 1/3

(iii) 3

(iv) 1

(i) When a vertical face excavation was made in a clayey silt, having density of 20 KN/m^3, it failed at a depth of excavation of 4m. What is the cohesive strength (in KN/m^2) of the soil, if its angle of internal friction was 30°?

(i) 23.1

(ii) 20.0

(iii) 11.6

(iv) 10.2

(j) A good quality undisturbed soil sample is one which is obtained using a sampler having an area ratio of

(i) 8%

(ii) 18%

(iii) 24%

(iv) 30%

2. (a) What do you understand by Active earth pressure, passive earth pressure and earth pressure at rest condition? (5)

(b) A retaining wall 6 m in height retains earth with its face vertical. The earth is cohesionless with particle specific gravity 2.69, angle of internal friction 35° and porosity 40.5%. The earth surface is horizontal and level with the top surface of the wall. Determine the earth thrust and its line of action on the wall if water table is present at a level 2.5 m below the top surface. Neglect the wall friction and draw pressure diagrams. (10)

3. (a) Discuss different modes of soil failures under a shallow foundation. (5)

(b) When a vertical face excavation was made in a clay deposit it failed at a depth of 2.8 m of excavation. Find the shear strength parameters of the soil if its bulk density is 17 KN/m^3 In this deposit, at some other location, a plate load test was conducted with 30cm square plate, placed at a depth of 1 m below ground level. The ultimate load was 13.5 KN. Water table was at a depth of 4 m below ground level. Calculate the net safe bearing capacity for a 1.5 m wide strip footing to be founded at a depth of 1.5 m in this soil. Take factor of safety as 3. Use Terzaghis bearing capacity theory. (10)

4. (a) Discuss the effect of water table on the bearing capacity of soil. (5)

(b) Discuss the limitations of plate load test. (4)

(c) What are the different components of total settlement of a shallow foundation? Estimate the immediate settlement of a concrete footing 1.5 × 1.5 m in size founded at a depth of 1 m in silty soil whose modulus of elasticity is 90 kg/cm^2. The footing is expected to transmit a pressure of 200 KN/m^2. Given Poisson's ratio= 0.35, influence actor = 0.82. (3+3)

5. (a) Discuss the variation of vertical stress in soil under a point load in a horizontal plane at a constant depth with Boussinesq's theory. Compare the results with Westergaard's theory. (5)

(b) A rectangular area 2 m × 4 m carries a uniform load of 80 KN/m^2 at ground surface Find the vertical pressure at 5 m below the center of loaded area by equivalent point load method. (5)

(c) Discuss Newmarks's influence chart method for calculation of vertical stress at any point under a uniformly loaded area of any shape. (5)

6. (a) A square footing of width 2.5 m is placed on a sandy soil at a depth of 2m from ground surface. The sand has a bulk unit weight of 18.7 KN/m^3. Adopting a factor of safety of 3, determine the net safe bearing capacity of footing when the water table is at a depth of 1.5 m from the base of the footing. Use I. S. 6403, 1981 procedure Given; Angle of shearing resistance $\phi = 36°$, $N_q = 37.8, N_\gamma = 56.5$. (10)

(b) A retaining wall, 8 m high, with smooth vertical vertical back, retains a clay backfill with c = 20 KN/m^2, $\phi = 15°$ and $\gamma = 18$ KN/m^3. Calculate the total active thrust on the wall assuming that tension caracks may develop to full theoretical depth. (5)

7. (a) State the limitations of dynamic formulae for pile capacity. (3)

(b) Explain briefly the term negative skin friction of piles. (4)

(c) 200mm diameter, 8 m long piles are used as foundation for a column in a uniform deposit of medium clay (unconfined compressive strength 100 KN/m^2 and adhesion factor 0.9). There are 9 piles arranged in a square pattern of 3 × 3. For a group efficiency of 1, find the spacing between the piles (neglect bearing). (8)

8. (a) Draw a typical well foundation and show its different components. (4)

(b) What are the corrections that must be done to the observed N-value of a soil. Explain the corrections in brief. (5)

(c) What is a bore-log? Explain by drawing a bore-log. (6)

9. Write short notes on any five from the following (5 × 3 = 15)

(a) Degrees of freedom of a block foundation

(b) Critical depth of a pile

(c) Natural frequency and resonance.

(d) Functions of Geotextiles.

(e) Vertical sand drains.

(f) Vibrofloatation technique of ground improvement.
