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CE 131703 NR

Roll No. of candidate

28/2/22 2021

B.Tech. 7th Semester End-Term Examination

Civil

GEOTECHNICAL ENGINEERING – II

(New Regulations)

Full Marks – 70   Time – Three hours

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

Answer question No. 1 and any *four* from the rest.

1. Choose the correct option from the following : $(10 \times 1 = 10)$

   (i) The coefficient of passive earth pressure for $\varphi = 30°$ is

   (a) 2.33   (b) 0.33

   (c) 3.00   (d) 1.00

   (ii) The SPT-N value is the number of blows required to drive the sampler through the last

   (a) 15 cm   (b) 30 cm

   (c) 45 cm   (d) 50 cm

   (iii) The type of sampler used in standard penetration test is

   (a) Shelby tube sampler   (b) Piston Sampler

   (c) Split Spoon Sampler   (d) Scraper bucket sampler

   (iv) The maximum load which can be carried by a pile is defined as its _____.

   (a) Bearing capacity   (b) Ultimate bearing capacity

   (c) Safe bearing capacity   (d) Allowable bearing capacity

[Turn over

(v) The bearing capacity factors are functions of

(a) Width and depth of footing   (b) Density of soil

(c) Cohesion of soil   (d) Angle of internal friction of soil

(vi) Minimum centre to centre spacing of friction piles of diameter D as per IS code is

(a) 2.5D   (b) 3D

(c) 1.5D   (d) 2D

(vii) Westergaard's formula for stress distribution beneath loaded areas is applicable to

(a) Sandy soil   (b) Clayey soil

(c) Stratified soil   (d) Silty soil

(viii) What is the factor of safety used for determining the safe-load carrying capacity of a pile in Engineering News Record formula?

(a) 6.0   (b) 4.0

(c) 3.0   (d) 2.5

(ix) The lateral earth thrust is

(a) Directly proportional to the depth of soil

(b) Inversely proportional to the depth of soil

(c) Directly proportional to the square of depth of soil

(d) Inversely proportional to the square of depth of soil

(x) Well foundation is an alternate name for

(a) Pneumatic caisson   (b) Box caisson

(c) Open caisson   (d) All of the above

2. (a) List the differences between active earth pressure and passive earth pressure. (5)

(b) A retaining wall with smooth vertical back, 4m high, retaining a soil with $c' = 30$ kN/m², $\phi' = 30°$ and $\gamma = 20$ kN/m³. The horizontal backfill surface carries 60 kN/m² uniformly surcharge load. If the retaining wall is caused to move towards the soil to activate passive resistance, draw the pressure distribution diagram. Determine the total passive pressure & its point of application. (10)

3. (a) List out the assumptions of Terzaghi's bearing capacity theory. (5)

   (b) A strip footing 2m wide with its base at a depth of 1m is resting on a sand stratum. The water table is at a depth of 0.25m below the ground level. Assuming γ_d = 16kN/m³, γ_{sat} = 20 kN/m³ and ϕ' = 35°, determine the ultimate bearing capacity using Terzaghi's theory. What will be the change in bearing capacity if the water table is 0.25m below the base of footing? (10)

4. (a) What are the different methods of soil exploration? (5)

   (b) The following data was obtained from plate load test carried on a 60cm square test plate at a depth of 2m below ground surface on a sandy soil.

Load intensity t/m² :	0	5	10	15	20	25	30	35	40
Settlement mm :	0	2.0	4.0	7.0	11.0	16.3	23.5	34.0	45.0

   Determine the settlement of foundation 3m × 3m carrying a load of 110 t located at a depth of 2 m below ground surface. Also for a permissible settlement of 25 mm for the footing find the allowable bearing pressure. (10)

5. (a) Discuss Newmark's influence chart method for calculation of vertical stress. (5)

   (b) Compare Boussinesq's&Westergard's theory of stress distribution in soils. (5)

   (c) A footing 2m × 1m exerts a uniform pressure of 150 kN/m² on the soil. Assuming a load distribution of 2V : 1H, calculate the average vertical stress at 1m below the footing. (5)

6. (a) Briefly discuss types of pile foundation. (5)

   (b) Write short notes on any two : (5 × 2 = 10)
       (i) Critical depth of pile
       (ii) Negative skin friction
       (iii) Geo-textiles

7. (a) Draw a typical well foundation showing its different components. (5)

   (b) What are the factors that affect the depth of a well foundation? (5)

   (c) The inner diameters of a sampling tube and that of a cutting edge are 60mm and 58mm respectively, and their outer diameters are 62mm and 64mm respectively. Calculate the inside clearance, outside clearance and area ratio. (5)