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002607

May 2023

B.Tech. (Civil) VI SEMESTER

Foundation Engineering (PEC-CV-404-1)

Time : 3 Hours]   [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Use of a non-programmable scientific calculator is allowed.*

PART–A

1. (a) Write difference between General and Local Shear Failure. (1.5)

(b) Define pressure bulb and it's significance. (1.5)

(c) Name different type of well foundations with neat sketch. (1.5)

(d) Draw contact pressure distribution for cohesive soil. (1.5)

(e) What is SPT? (1.5)

(f) What is the function of a 'foundation'? (1.5)

(g) Write the Engineering News Formula. (1.5)

(h) Explain the function of pile foundation and show how the bearing capacity of the foundation can be estimated. (1.5)

(i) Write briefly on 'Taylor's Stability Number'. (1.5)

(j) Define "Optimum moisture content of a soil" and state on what factors it depends. (1.5)

PART–B

2. (a) Describe a suitable method of stability analysis of slopes in (i) purely saturated cohesive soil, (ii) cohesionless sand. (10)

   (b) Write brief critical notes on Tolerable settlements for buildings and other structures' for various soil types. (5)

3. (a) Differentiate between 'total settlement' and 'differential settlement'. What are the harmful effects of differential settlement on structures? What are the possible remedial measures? (5)

   (b) A clay layer 25 m thick has a saturated unit weight of 19.2 kN/m^2. Ground water level occurs at a depth of 5 m. It is proposed to construct a reinforced concrete foundation, 12.5 m $\times$ 50 m, on top of the layer, to transmit a uniform pressure of 150 kN/m^2. Determine the settlement at its centre, assuming that the void ratio drops from 0.725 to 0.700 due to loading. E for the clay is 30 MN/m^2. (10)

4. The unit weight of a soil of a 30° slope is 17.5 kN/m^3. The shear parameters c and φ for the soil are 10 kN/m^2 and 20° respectively. Given that the height of the slope is 12 m and the stability number obtained from the charts for the given slope and angle of internal friction is 0.025, compute the factor of safety. (15)

5. (a) Write an explanatory note on the general types of foundations, with suitable sketches. (5)

   (b) A square pile 25 cm size penetrates a soft clay with unit cohesion of 75 kN/m^2 for a depth of 18 m and rests on stiff soil. Determine the capacity of the pile by skin friction. Assume an adhesion factor of 0.75. (10)

6. (a) A precast concrete pile is driven with a 30 kN drop hammer with a free fall of 1.5 m. The average penetration recorded in the last few blows is 5 mm per blow. Estimate the allowable load on the pile using the Engineering News Formula. (10)

   (b) What is the ultimate load which an eccentrically loaded square footing of 2 m size with an eccentricity of 0.40 m can take at a depth of 0.6 m in a soil with Y = 20 kN/m^3, c = 12 kN/m^2, and φ = 30°, Nc = 30, Nq = 18, and NY = 15. (5)

7. Explain why soils are compacted in the field ? How is the degree of compaction ensured in the field (i.e., control of field compaction)? Distinguish between 'compaction' and 'consolidation' of soils. Bring out the effects of (i) moisture, (ii) compactive effort and (iii) soil type on the compaction characteristics of soils. Illustrate the answer with typical 'moisture-dry density' plots. (15)