Ref. No.: Ex/CE/5/T/408/2023(S)

# BACHELOR OF ENGINEERING (CIVIL ENGINEERING) FOURTH YEAR SECOND SEMESTER SUPPLEMENTARY EXAM 2023

## Design of Foundation

### PART-I

**[ Answer All the Questions]**

[Use code: IS: 6403 & IS: 8009]

[ Assume any data reasonably wherever necessary ]

**Total = 100**

**This Part = 50**

| | | |
|---|---|---|
| 1. | Discuss briefly the plate load test in connection with the determination of bearing capacity and settlement of granular soil. | [ 12 ] |
| 2. | Column carrying a superimposed load of 600 kN is to be founded on a sandy deposit as shown in the Figure below. Design a suitable isolated footing for the same.<br>G. L.<br>1.5m<br>Loose whitish grey silty fine sand<br>$\gamma = 1.8$ t/m$^3$<br>$\gamma' = 0.8$ t/m$^3$, $\varphi' = 30$, Avg. N = 10<br>3.0m<br>Medium dense brownish grey silty fine sand with mica<br>$\gamma = 1.87$ t/m$^3$, $\varphi' = 32$, Avg. N = 16<br>10.0m<br>Dense to very dense brownish grey silty fine sand<br>$\gamma = 1.93$ t/m$^3$, $\varphi' = 34$, Avg. N = 23<br>20.0m | [ 20 ] |
| 3. | A raft foundation with dimensions 8m x 12m is to be constructed at a depth 1.5m below ground surface. The net foundation pressure can be taken as 38 kN/m$^2$. Calculate the total settlement of the foundation. The subsoil profile is given below. [*Assume water table at the base of the footing*]<br>G. L.<br>Silty Clay<br>$\gamma = 1.8$ t/m$^3$<br>$\gamma' = 0.9$ t/m$^3$, Cu = 32 kN/m$^2$, $\frac{C_c}{1+e_0} = 0.06$<br>4.0m<br>Silty Clay<br>$\gamma = 1.8$ t/m$^3$<br>Cu = 20 kN/m$^2$, $\frac{C_c}{1+e_0} = 0.13$<br>11.0m<br>Silty Clay with Kankar<br>$\gamma = 1.9$ t/m$^3$<br>Cu = 48 kN/m$^2$, $\frac{C_c}{1+e_0} = 0.08$<br>20.0m | [18] |

[ Turn over

Ex/CE/5/T/408/2023 (S)

**B. E. (CIVIL ENGIEERING) FOURTH YEAR SECOND SEMESTER EXAM 2023**
**(Supplementary)**

**DESIGN OF FOUNDATION**
PART-II

Time: Three Hours

Full Marks 100
(50 marks for each part)

Use a separate Answer-Script for each part
**[No code or handbook is allowed, assume any suitable data]**

| No. of questions | | Marks (50) |
|---|---|---|
| 1) | Determine the allowable pile load capacity of a 750 mm RCC bored cast in situ pile of length 15 m installed in a soil as per following sub soil profile. Assume Nq value of loose and dense sand as 15 and 42 respectively, and assume value of δ and K as per Brooms recommendations.<br>3 m — Loose Sand; $\gamma_t = 18$ kN/m$^3$, $\varphi' = 27^0$ WT ▽<br>9 m — Soft Clay; $\gamma_t = 19$ kN/m$^3$, $c_u = 20$ kN/m$^2$, $\alpha = 1$<br>15 m — Dense Sand ; $\gamma_{sat} = 20$ kN/m$^3$, $\varphi' = 35^0$ | 15 |
| 2) | A group of nine piles, each having diameter of 450 mm, length 15 m, and spacing 1050 mm is driven in a sandy soil deposit having depth 20 m, underlain by a hard stratum. Calculate ultimate load capacity of pile group. If settlement of a single pile at safe load capacity is 10 mm then what will be the settlement of the pile group. Assume the properties of sand as $\varphi' = 32°$; $\delta = ¾\ \varphi'$ ; $N_q = 27$ | 20 |
| 3) | Write short note on any of the three:-<br>(a) Engineering News Formulae<br>(b) Calculation of settlement of a pile group<br>(c) Group action of pile group<br>(d) Negative skin friction<br>(e) Concept of critical depth in cohesionless soil | 5X3=15 |