

BACHELOR OF ENGINEERING (CIVIL ENGINEERING)
FOURTH YEAR SECOND SEMESTER EXAM 2025

Design of Foundation

PART-I

Time: Three Hours

[Answer All the Questions]

[Use code: IS: 6403, IS: 2131, IS: 1904 (2021), IS: 8009 (Part-I)]

[Assume any data reasonably wherever necessary]

Total = 100
This Part = 50

1. (a)	Write a short note on ' <i>Location and Depth Criteria</i> ' in design of shallow foundation.	[9+6]
(b)	Discuss in brief about the ' <i>interference effect</i> ' of closely spaced footings.	
2.	Column carrying a superimposed load of 720 kN is to be founded on a sandy deposit as shown in the Fig. 1. Design a suitable isolated footing for the same. <i>[For settlement criteria, estimate settlement using: (a) SPT 'N' value, (b) Elastic Method and (c) Buisman method and use the average one in the design.]</i> G. L. 1.5m Loose whitish grey silty fine sand $\gamma = 1.8 \text{ t/m}^3$ $\gamma' = 0.8 \text{ t/m}^3$, $\phi' = 30$, Avg. N = 10 3.0m Medium dense brownish grey silty fine sand with mica $\gamma = 1.87 \text{ t/m}^3$, $\phi' = 32$, Avg. N = 16 10.0m Dense to very dense brownish grey silty fine sand $\gamma = 1.93 \text{ t/m}^3$, $\phi' = 34$, Avg. N = 23 20.0m Fig. 1	[22]
3.(a)	The results of a plate-load test in a sandy soil are shown in the Fig. 2. The size of the plate is 0.30 m x 0.30 m. Determine the size of a square column foundation that should carry a load of 1800 kN with a maximum settlement of 50 mm. Fig. 2	[7+6]
(b)	Discuss the limitations of plate-load test.	

[Turn over

B. E. (CIVIL ENGINEERING) FOURTH YEAR SECOND SEMESTER EXAM 2025
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)	Write short notes on: - (a) Advantage and disadvantages of bored piles (b) Settlement calculation of pile group in sandy soil (c) Initial pile load test (d) Group action of pile group	5X4=20
2)	Determine the safe pile load capacity of a 600 mm RCC bored cast in situ pile of length 20 m installed in a soil as per following sub soil profile. Assume N_q value of loose and dense sand as 30 and 50 respectively, and assume value of δ and K as per Brooms recommendations. Pile cut off level 1 m below GL. 3 m Soft Clay; $\gamma_t = 18 \text{ kN/m}^3$, $c_u = 30 \text{ kN/m}^2$, $\alpha = 1$ WT 10 m Loose Sand; $\gamma_{\text{sat}} = 19 \text{ kN/m}^3$, $\phi' = 27^\circ$ Dense Sand; $\gamma_{\text{sat}} = 20 \text{ kN/m}^3$, $\phi' = 35^\circ$	15
3)	A group of 9 piles in square pattern is installed into a soft, saturated normally consolidated clay deposit. Each pile has a diameter of 500 mm and a length of 15 m. The piles are spaced 1.5 m c/c. The total vertical load on the pile group through rigid pile cap is 2500 kN. The clay layer extends to a depth of 25 m, and below this is a stiff layer. Assume that settlement of the pile group occurs primarily due to consolidation of the clay beneath the group. The average properties of the clay layer are: Pile spacing, $s = 1.5 \text{ m}$, Initial void ratio, $e_0 = 1$, Compression index, $C_c = 0.3$, Unit weight of clay, $\gamma = 18 \text{ kN/m}^3$, and consider water table at ground surface. Evaluate the consolidation settlement of the pile group assuming the group acts as a block.	15