

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Use of calculator is allowed

Q.No	Question	CO	Marks
Q1	A strip footing of width 2 m is constructed at a depth of 1.5 m below ground level in a saturated clay soil. The properties of clay are: Undrained cohesion, $c_u = 60 \text{ kN/m}^2$ Unit weight of saturated clay, $\gamma = 18 \text{ kN/m}^3$ Using Skempton's bearing capacity equation, calculate: a) Ultimate bearing capacity of the foundation b) Net ultimate bearing capacity c) Safe bearing capacity for a factor of safety of 3.	1,2	4
Q2	A pile is driven into the ground using a steam hammer. The following observations were recorded during the final stage of driving: - Weight of hammer, $W = 25 \text{ kN}$ - Height of fall of hammer, $h = 0.75 \text{ m}$ - Final penetration of pile per blow, $s = 8 \text{ mm}$ - Factor of safety, $\text{FOS} = 6$ - Type of hammer: Steam hammer Calculate ultimate load carrying capacity of the pile using Engineering News Formula.	1,2	3
Q3	A strip footing of width 2 m is founded at a depth of 1.2 m below ground level in a homogeneous soil. The soil has the following properties: - Cohesion, $c = 25 \text{ kN/m}^2$ - Angle of internal friction, $\phi = 30^\circ$ - Unit weight of soil, $\gamma = 18 \text{ kN/m}^3$ $N_c = 37.2$, $N_q = 22.5$, $N_\gamma = 19.7$	2,3	4

	Using Terzaghi's bearing capacity equation, calculate: a) Ultimate bearing capacity of the soil b) Net ultimate bearing capacity c) Net safe bearing capacity considering a factor of safety of 3.		
Q4	A rectangular footing of size 3 m × 2 m is subjected to a vertical load of 900 kN acting with an eccentricity of 0.25 m along the length of the footing. The foundation is placed at a depth of 1.5 m in sand having: - Unit weight, $\gamma = 19 \text{ kN/m}^3$ - Cohesion, $c = 0$ - Angle of internal friction, $\phi = 35^\circ$ Bearing capacity factors: $N_q = 33.3$, $N_\gamma = 35$ Calculate: a) Effective dimensions of footing using Meyerhof's effective area concept b) Ultimate bearing capacity using Terzaghi equation c) Check whether the applied pressure is safe if factor of safety = 3.	3	4