

7. A Square footing located at a depth of 1.3 m below the ground has a carry a safe load of 800 kN. Find the size of the footing if the desired factor of safety is 3. The soil has the following properties:

Void ratio=0.55; Degree of saturation=50%; Specific gravity=2.67; $c = 8 \text{ kN/m}^2$ $\phi = 30^\circ$. Use Terzaghi's analysis ($N_c = 37.2$; $N_q = 22.5$; and $N_\gamma = 19.7$). 14

8. (a) What are the assumptions made in the derivation of Terzaghi's bearing capacity theory? 4

(b) A n-pile group has to be proportioned in a uniform pattern in soft clay with equal spacing in all directions. Assuming any value of c , determine the optimum value of spacing of piles in the group. Take $n=25$ and $\alpha=0.7$ Neglect the end bearing effect and assume that each pile is circular in section. 10

9. A circular well of 6 m external diameter and 4 m internal diameter is embedded to a depth of 15 m below the maximum scour level in a sandy soil deposit. The well is subjected to a horizontal force of 800 kN acting at a height of 8 m above the scour level. Determine the allowable total equivalent resisting force due to earth pressure, assuming (a) rotation is about a point above the base (b) the rotation is at the base. Take $\gamma = 20 \text{ kN/m}^3$, $\phi = 30^\circ$; factor of safety for passive resistance = 2.0. Use Terzaghi's analysis. 14

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B.Tech.7th Semester Special Examination,2016

Foundation Engineering

Time : 3 hours

Full Marks : 70

Instructions :

- There are **Nine** questions in this paper.
- Attempt **Five** questions in all.
- Questions No.1 is Compulsory.**
- The marks are indicated in the right hand margin.
- Assume any suitable data, if required.

1. Answer any seven questions from the following; 2×7=14

- What is a coffer dam?
- Define swelling potential.
- Explain the following term:
Natural frequency
- Determine the natural frequency of machine foundation having a base area 2 m×2 m and a mass of 15 Mg. including the mass of machine. Taking $C_v = 4.0 \times 10^4 \text{ kN/m}^3$.
- What is an expansive soil?
- What are the different purposes for which site investigation are done?

- (g) What are different shapes of wells?
- (h) What is the basic difference between a drilled pier and a caisson?
- (i) What are the various corrections of the standard penetration test?
- (j) A rectangular footing ($3\text{ m} \times 2\text{ m}$) exerts a pressure of 100 kN/m^2 on a cohesive soil ($E_s = 5 \times 10^4\text{ kN/m}^2$, $I = 1.06$ and $\mu = 0.50$). Determine the immediate settlement at the centre.
2. Check the stability of floating caisson 10.5 m high and having a rectangular base $20\text{ m} \times 9\text{ m}$. The weight of the caisson is 9 MN and its centre of gravity is 4.0 m above the base. If the caisson is unstable, how would you make it stable? Take unit weight of water as 10.25 kN/m^3 . What is maximum pressure on the soil when the caisson has been fully installed? The base is at a depth of 9 m below the water level. The total weight is 50 MN , which acts at an eccentricity of 0.1 m . 14
3. A straight shaft pier is constructed in an expansive soil. If the length of the pier is 6 m and the shaft diameter is 0.75 m , determine the factor of safety for no dead load and that for a dead load of 200 kN . The depth of the active zone is 2.5 m . Assume swell pressure (p_s) = 400 kN/m^2 , Coefficient of uplift between concrete and soil (α_u) = 0.15 . Coefficient of adhesion (α) = 0.55 undrained cohesion = 100 kN/m^2 . 14

4. (a) Discuss various dynamic formula for pile foundation. 6
- (b) A concrete pile, 30 cm diameter, is driven into a medium dense sand ($\phi = 35^\circ$, $\gamma = \text{kN/m}^3$, $K = 1.0$, $\tan \delta = 0.70$, $D_c/B = 12$, $N_q = 60$) for a depth of 8 m . Estimate the safe load, taking a factor of safety of 2.50 . 8
5. (a) Assuming resonance to have occurred at the frequency of 22 cycle/second in a vertical vibration of a test block. $1.0\text{ m} \times 1.0\text{ m} \times 1.0\text{ m}$ size, determine the coefficient of elastic uniform in compression (C_p). The weight of oscillator is 62 kg and the force produced by it at 12 cycle/second is 100 kg . Also compute the maximum amplitude in vertical direction at 12 cycle/seconds . 8
- (b) Plate load tests were conducted in a $c - \phi$ soil, on plates of two different sizes and the following results were obtained.

Load	Size of Plate	Settlement
40kN	0.3m \times 0.3m	25mm
100kN	0.6m \times 0.6m	25mm

Find the size of square footing to carry a load of 800 kN at the same specified settlement of 25 mm 6

6. A single under reamed pile is installed in a soft clay deposit. The centre of under ream is located at a depth 15 m from the ground surface. The diameter of the pile shaft and bulb are respectively 1.0 m and 2.5 m . Determine the allowable load with a factor of safety 2.5 . The undrained shear strength of the soil obtained from the vane shear test is given by the relation $c_u = 65 + 7D$. Where c_u is in kN/m^2 and D is the depth in meters. Assume $\alpha = 1$. 14