



**Q-3 Attempt all questions**

- (a) Derive an expression for the vertical stress at a point due to a point load, using Boussinesq's theory. (08)
- (b) A point load of 600 kN act at the surface of an infinite half space. Determine the vertical stresses at a depth of 5 m directly below the load. Also determine the vertical stresses for the same depth at a radial distance of 4 m using Boussinesq's expression. (06)

**Q-4 Attempt all questions**

- (a) Discuss the various methods of boring for soil exploration with neat sketches. (06)
- (b) Explain the different types of shallow foundation with neat sketches. (06)
- (c) Write short notes on static cone penetration test. (02)

**Q-5 Attempt all questions**

- (a) Determine the ultimate bearing capacity of strip footing, 1.2 m wide and 1 m depth with angle of internal friction  $10^\circ$ , cohesion of soil as 15 kPa and density of soil as  $18 \text{ kN/m}^3$ . Assume general shear failure and refer Table 1 for bearing capacity factors. (06)

**Table 1 - Terzaghi's bearing capacity factors**

$\Phi'$	General shear failure			Local shear failure		
	$N_c$	$N_q$	$N_\gamma$	$N'_c$	$N'_q$	$N'_\gamma$
0	5.7	1.0	0.0	5.7	1.0	0.0
5	7.3	1.6	0.5	6.7	1.4	0.2
10	9.6	2.7	1.2	8.0	1.9	0.5
15	12.9	4.4	2.5	9.7	2.7	0.9

- (b) A circular footing rests on pure clay with  $q_u = 270 \text{ kN/m}^2$ , at a depth of 1.8 m. Determine the diameter of the footing if it has to transmit a load of 720 kN. Assume the bulk unit weight of soil as  $18 \text{ kN/m}^3$  and the factor of safety as 3. Refer Table.1 for bearing capacity factors. (06)
- (c) Enumerate the components of settlement. (02)

**Q-6 Attempt all questions**

- (a) Discuss the various classifications of piles in detail with neat sketches. (06)
- (b) Explain the negative skin friction of piles with a neat sketch. (04)



- (c) What will be the penetration per blow of a pile which must be obtained in driving with a 30 kN steam hammer falling through a 1m if allowable load is 250kN? (04)

**Q-7 Attempt all questions**

- (a) Explain with neat sketch find the active earth pressure using Culmann's method. (08)
- (b) A retaining wall, 6 m high, retains dry sand with an angle of friction of  $30^\circ$  and unit weight of  $16.2 \text{ kN/m}^3$ . Determine the earth pressure at rest. If the water table rises to the top of the wall, determine the increase in the thrust on the wall. The submerged unit wt of sand as  $10 \text{ kN/m}^3$ . (06)

**Q-8 Attempt all questions**

- (a) Derive an expression for simplified Bishop's method. (06)
- (b) How will you classify typical slope failures that occur in a soil mass? Explain with sketches. (06)
- (c) How a slope is analyzed using Swedish circle method. (02)

