JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION-2025

B.Tech VIII Semester (CE)

COURSE CODE (CREDITS): 18B1WCE733 (3) MAX. MARKS: 25

COURSE NAME: Advanced Foundation Engineering

COURSE INSTRUCTORS: Dr. Saurav MAX. TIME: 1.5 Hour

***Note: (a)*** *All questions are compulsory.*

*(b)Marks are indicated against each question in square brackets.*

| Q.No | Question | CO | Marks |
|---|---|---|---|
| **Q 1.** | Calculate the net ultimate bearing capacity $q_{nu}$, and the net allowable bearing pressure $q_{na}$ (F, = 3), given the following with reference to Fig. 1. B= 3 m, $D_f$ = 2.5 m, $D_1$ = 0.5 m<br>The soil is assumed as clay and foundation square. Table 1 gives the value of limit pressure $p_l$ at various depths | 2 | 5 |

**Table 1**

| *Depth below GL (m)* | $\bar{p}_l$ *kPa* | *Depth below GL (m)* | $\bar{p}_l$ *kPa* |
|---|---|---|---|
| 0.5 | 350 | 6.5 | 700 |
| 1.5 | 500 | 7.5 | 725 |
| 2.5 | 600 | | |
| 3.5 | 625 | | |
| 4.5 | 600 | | |
| 5.5 | 675 | | |

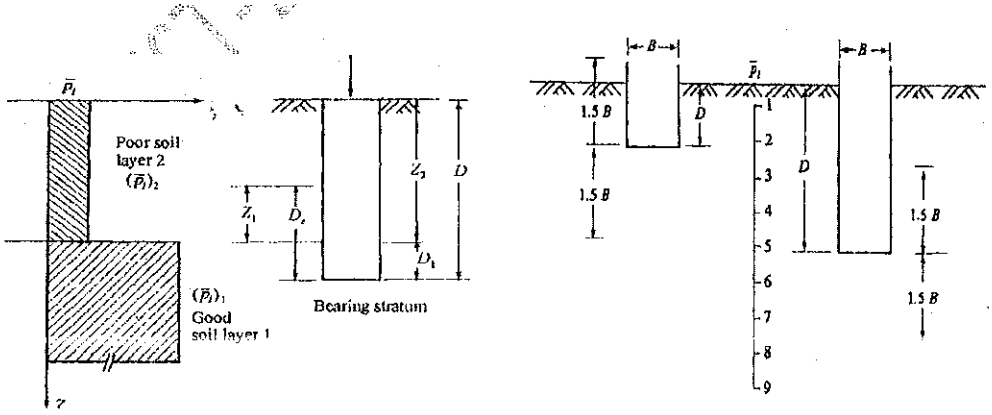


**Fig. 1:** zone of influence of foundation and foundation on two layer soil

| | | | |
|---|---|---|---|
| **Q2.** | A square footing of size 8 x 8m is founded at a depth of 2 m below the ground surface in loose to medium dense sand with $q_n$ = 120 kN/m$^2$. Standard penetration tests conducted at the site gave the following corrected $N_{60}$ values.<br><br>*Depth below GL (m)* / $N_{cor}$ / *Depth below GL* / $N_{cor}$<br>2 / 8 / 10 / 11<br>4 / 8 / 12 / 16<br>6 / 12 / 14 / 18<br>8 / 12 / 16 / 17<br>18 / 20<br><br>The water table is at the base of the foundation. Above the water table $\gamma_t$ = 16.5 kN/m$^3$, and submerged $\gamma_b$ = 8.5 kN/m$^3$ , Compute the elastic settlement equation, given $E_s$ = 250 ($N_{cor}$ + 15) for computing the modulus of elasticity of the sand. Assume $\mu$ = 0.3 and the depth of the compressible layer = 2B = 16 m (=H). | 3 | 7 |
| **Q3.** | The observed standard penetration test value in a deposit of fully submerged sand was 45 at a depth of 6.5 m. The average effective unit weight of the soil is 9.69 kN/m$^3$. The other data given are: hammer efficiency = 0.8, drill rod length correction factor = 0.9 borehole correction factor = 1.05. Determine the corrected SPT value for standard energy:<br>(a) $R_{es}$ = 60 percent, and (b) $R_{es}$ = 70%. | 3 | 5 |
| **Q4.** | Discuss the factors affecting the stability of boreholes during drilling operations. Explain the causes and preventive measures for (i) caving of the sides of the hole, and (ii) heaving of the bottom of the hole. Illustrate your answer with suitable examples. | 3 | 4 |
| **Q5.** | Explain the significance of soil sampling in geotechnical engineering. Differentiate between disturbed and undisturbed soil samples, highlighting their respective applications, laboratory tests, and limitations. Discuss the factors affecting the reliability of undisturbed soil samples and how these issues can be minimized. | 3 | 4 |