JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION-2025

B.Tech VIII Semester (CE)

COURSE CODE (CREDITS): 18B1WCE733 (3) MAX. MARKS: 35

COURSE NAME: Advanced Foundation Engineering

COURSE INSTRUCTORS: Dr. Saurav MAX. TIME: 2 Hour

Note: (a) All questions are compulsory.

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

<table>
<tr><th>Q.No</th><th>Question</th><th>CO</th><th>Marks</th></tr>
<tr><td>Q 1.</td><td>A soil profile consists of a 3-meter thick clay layer with a permeability of 1×10^{-7} m/s overlying a 5-meter thick sand layer with a permeability of 1×10^{-3} m/s. The head difference across the entire profile is 2 meters. What is the total flow rate (Q) through the soil profile per unit area (q) assuming Darcy's Law holds?</td><td>2</td><td>5</td></tr>
<tr><td>Q2.</td><td>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.
<table>
<tr><th>Depth below GL (m)</th><th>N_{cor}</th><th>Depth below GL</th><th>N_{cor}</th></tr>
<tr><td>2</td><td>8</td><td>10</td><td>11</td></tr>
<tr><td>4</td><td>8</td><td>12</td><td>16</td></tr>
<tr><td>6</td><td>12</td><td>14</td><td>18</td></tr>
<tr><td>8</td><td>12</td><td>16</td><td>17</td></tr>
<tr><td></td><td></td><td>18</td><td>20</td></tr>
</table>
The water table is at the base of the foundation. Above the water table γ = 16.5 kN/m^3, and submerged γ_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 μ= 0.3 and the depth of the compressible layer = 2B = 16 m (=H).</td><td>3</td><td>7</td></tr>
<tr><td>Q3.</td><td>A soil sample has a void ratio of 0.72, moisture content = 12% and Gs = 2.72 determine the following: a) Dry unit weight, moist unit weight (kN/m^3).
b) Weight of water in KN/m^3 to be added for 80% degree of saturation.
c) Is it possible to reach a water content of 30% without change the present void ratio.
d) Is it possible to compact the soil sample to a dry unit weight of 23.5 KN/m^3.</td><td>3</td><td>6</td></tr>
<tr><td>Q4.</td><td>Explain the factors that influence the stability of boreholes during drilling operations. Describe the causes and preventive measures for (i) caving of the borehole sides and (ii)</td><td>3</td><td>5</td></tr>
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	heaving at the bottom of the borehole. Provide relevant examples to support your explanation.		
Q5.	Describe the importance of soil sampling in geotechnical engineering. Compare disturbed and undisturbed soil samples, emphasizing their uses, laboratory tests, and limitations. Examine the factors that influence the accuracy of undisturbed soil samples and suggest ways to minimize these challenges.	4	5
Q6.	A proposed earth dam requires 7500 m^3 of compacted soil with relative density of 94%, maximum void ratio of 0.73, minimum void ratio of 0.4 and specific gravity (Gs)=2.67. Two borrow pits are available as described in the following table. Choose the best borrow pit with minimum cost	4	7

Borrow pit	Degree of saturation	Moisture content	Cost (Rs/m^3)
A	82	18.43	10
B	100	24.34	5