Ref. No. Ex/CE/5/T/302/2024

BACHELOR OF ENGINEERING (CIVIL ENGINEERING) EXAMINATION 2024

[Third Year; First Semester]

SOIL MECHANICS - I (Part-I)

Total Time: Three Hours | Full Marks: 100 (60+40)

Answer all the questions
Answer should be brief and to the point.
Assume any data reasonably if needed

1. (a) Distinguish between Residual and Transported soil. (2)

   (b) Derive the relation between $\gamma_{sat}, G, \gamma_w, and\ n$ (5)

   (c) The following data on consistency limits are available for two soils A and B. (3)

S.No.	Index	Soil A	Soil B
1	Plastic limit	16%	19%
2	Liquid limit	30%	52%
3	Flowindex	11	06
4	Natural water content	32%	40%

   Find which soil is

   (i) More plastic

   (ii) Better foundation material on remoulding.

   (iii) Better shear strength at plastic limit.

2. (a) Define: Aquifer, Aquiclude, and Aquifuge (3)

   (b) In a constant head permeability test, the following observations were taken: Height and diameter of the test sample = 15 cm and 5 cm; difference of water levels in piezometers = 40 cm, , quantity of water collected = 500 ml, duration of the test = 900 sec. Determine the coefficient of permeability of the soil. (7)

   If the dry mass of the 15 cm long sample is 486 g and specific gravity of the solids is 2.65. Calculate the seepage velocity of water during the test.

   (c) Describe the methodology and derivation, accompanied by a clear illustration, for determining the coefficient of permeability in the context of a pump-out test conducted for a confined aquifer. (10)

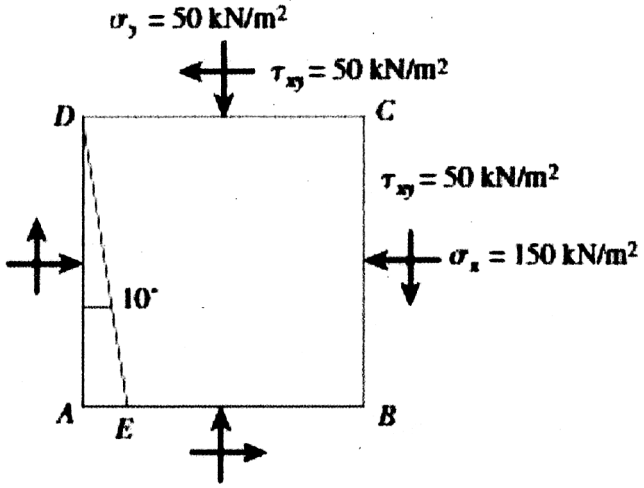
3. (a) What is the effect of capillary rise on effective stress? (2)

(b) Compute the total, effective, and pore pressure at a depth of 20 m below the bottom of a 6 m deep lake. The bottom of the lake consists of soft clay with a thickness of more than 20 m. the average water content of the clay is 35% and specific gravity of the soil may be assumed to be 2.65. (4)

(c) Explain in detail the procedure of drawing the phreatic line for an earthen dam. (14)

4. (a) Why triaxial shear test is considered better than direct shear test? (2)

(b) (8)



Determine the normal and shear stress on the plane DE by method of pole.

Ex/CE/5/T/302/2024

B. E. (CIVIL ENGIEERING) THIRD YEAR FIRST SEMESTER EXAM 2024

SOIL MECHANICS -I

PART-II

Time: Three Hours | Full Marks 100 (40 marks for Part II)

Use a separate Answer-Script for each part

<table>
<tr><th>No. of questions</th><th></th><th>Marks (40)</th></tr>
<tr><td>1)</td><td>The following data were recorded while performing the compaction test:

<table><tr><td>Water content (%)</td><td>05</td><td>10</td><td>14</td><td>20</td><td>25</td></tr><tr><td>Bulk density (kN/m^3)</td><td>17.7</td><td>19.8</td><td>21.0</td><td>21.8</td><td>21.6</td></tr></table>
Plot the compaction curve and find the optimum water content and maximum dry density. Provided G = 2.68, find air void percentage at maximum dry density. Also plot zero air voids curve.</td><td>8</td></tr>
<tr><td>2)</td><td>The in situ water content of a borrow pit is 18 % and bulk unit weight is 17 kN/m^3, specific gravity of the soil is 2.68. The soil is to be excavated and transported to construction site then compacted to minimum dry density of 17.6 kN/m^3 at moisture content 20 %. (a) How many cubic meter of borrow pit soil is required for 1000 Cu.M compacted fill? (b) How many trucks would be needed, if one truck can carry up to 6 ton of soil load?</td><td>8</td></tr>
<tr><td>3)</td><td>Construction of a new building founded on a clayey soil was completed in January 2014. In January 2019, the average consolidation settlement of the foundation in clay was recorded as 10 mm. The ultimate consolidation settlement was estimated in design as 40 mm. Considering double drainage to occur at the clayey soil site, calculate the consolidation settlement in January 2024. Consider one-dimensional consolidation.</td><td>8</td></tr>
<tr><td>4)</td><td>Write short note on :-
(a) Plasticity chart and its usefulness in classifying fine grained soil
(b) Differentiate between Standard Proctor Test and Modified Proctor Test
(c) Pre-consolidated clay and Normally-consolidated clay
(d) Time factor and Coefficient of consolidation</td><td>4 X 4=16</td></tr>
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