PAPER ID-410259

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B.TECH.
(SEM V) THEORY EXAMINATION 2021-22
GEOTECHNICAL ENGINEERING

Time: 3 Hours   *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   Attempt *all* questions in brief.   **2 x 10 = 20**

a.	What do you understand about index properties ?
b.	Differentiate between Specific gravity of solids and mass specific gravity.
c.	What is Bentonite?
d.	Define Muck.
e.	Draw the plasticity chart incorporated in IS:1498(1970) and give the group symbols of the various regions in the chart
f.	What do you understand by hydrogen bond?
g.	Define consolidation.
h.	What is flow net?
i.	What do you understand by the term Isobar?
j.	Differentiate between general shear failure and local shear failure

SECTION B

2.   Attempt any *three* of the following: **10x3=30**

a.	A mass of soil is coated with thin layer of wax . weight of soil and wax is 690.6 gm. Soil alone has 683 gm . When this sample is immersed in water it displaces 350 ml of water . Sp. Gravity of solids is 2.73 and that of wax 0.89. Find Void ratio and degree of saturation if water content in the soil is 17%.
b.	How is consolidation different from compaction ? What do you understand by the terms : immediate settlement, primary consolidation and secondary consolidation ?
c.	Representative samples of a layer of silty clay, 5 m thick, were tested in a consolidometer and the following results were obtained : initial void ratio = 0.90; Preconsolidation stress = 120 kN/m^2; Recompression index = 0.03 and Compression index = 0.27. Estimate the consolidation settlement if the present average overburden stress of the layer is 70 kN/m^2 and the increase in average stress in the layer is 80 kN/m^2.
d.	Derive an expression for the vertical stress under a circular area .Determine the vertical stress at a point P which is 3m below and at a radial distance of 3 m from the vertical load of 100 kN. Use Westergaard's solution.
e.	If the material of the base of the liquid limit apparatus on which the bowl containing soil drops is made of sponge, will the measured value of liquid limit of the soil be lower or higher than that measured using the standard apparatus which has a base made of hard rubber ? Discuss this result.

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SECTION C

3. **Attempt any *one* part of the following:** 10x1=10

a.	The following index properties were determined for two soils A and B. Which of these two soils (i) contains more clay particles (ii) has a greater bulk density (iii) has a greater dry density (iv) has a greater void ratio ?

Index properties	A	B
Liquid limit	65	35
Plastic limit	25	20
Water content	35	25
Sp.gr.of solids	2.70	2.65
Degree of saturation	100%	100%

b.	Define : (i) Thixotropy (ii) sensitivity (iii) activity

4. **Attempt any *one* part of the following:** 10x1=10

a.	(i) Explain how upward flow of seepage water causes the effective stress. What is the role of the pore water pressure in the quick sand condition . (ii) Derive the 'Laplace Equation' for the two dimensional seepage flow.
b.	What do you understand by the following terms ? (i) Flow lines and equipotential lines (ii) Piping failure (iii) Exit gradient

5. **Attempt any *one* part of the following:** 10x1=10

a.	What is the significance of the pore pressure coefficients ? Illustrate the answer by an example.
b.	A concentrated load of 40 kN acts on the surface of a soil. Determine the vertical stress increment at points directly beneath the load upto a depth of 10 m and draw a plot for the vertical stress variation upto depth of 10 m.

6. **Attempt any *one* part of the following:** 10x1=10

a.	Differentiate between (i) Ultimate bearing capacity & safe bearing capacity (ii) Safe bearing pressure and allowable bearing pressure.
b.	In an in situ vane shear test on a saturated clay , a torque of 35Nm was required to shear the soil . The diameter of the vane was 50 mm and length 100 mm . Calculate the undrained shear strength of the clay .

7. **Attempt any *one* part of the following:** 10x1=10

a.	Describe the triaxial shear test .What are the advantages of triaxial shear test over the direct shear test.
b.	How the static cone penetration test is different from standard penetration test ?