Code No: 115EQ

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, March - 2017
GEOTECHNICAL ENGINEERING
(Common to CE, CEE)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) Explain the formation of soil. [2]
b) Explain any two field tests to identify silts from clays. [3]
c) What is adsorbed water? [2]
d) What is Darcy's law and under what conditions it is valid. [3]
e) What are the factors affecting contact pressure? [2]
f) Differentiate between compaction and consolidation. [3]
g) What is secondary consolidation? [2]
h) What do you understand by normally consolidated, over consolidated and under consolidated clays. [3]
i) What is the Mohr-Coulomb theory of failure? [2]
j) State the limitations of direct shear test. [3]

PART - B

(50 Marks)

2. An oven dry soil sample of volume 300 cc weighs 450 g. If the specific gravity of solids is 2.65, what is the water content when the soil becomes fully saturated without any change in its volume? What will be the water content which will fully saturate the soil sample and also cause an increase in volume equal to 15% of the original dry volume? [10]

OR

3. Explain step by step procedure to classify soils as per I.S. Classification of soils. [10]

4. Derive an expression to determine coefficient of permeability of soil by laboratory falling head permeability test. [10]

OR

5. In a deposit of silty soil, the water table which was at originally at a depth of 1 m below ground level was lowered to 3m below ground level. The bulk and saturated unit weight of silty soil was 18kN/m^3 and 20kN/m^3 respectively. What is the change in effective pressure at a depth of 1.0m and 3.0m. [10]

6.a) Write the differences between standard and modified proctor compaction test.
b) Briefly explain factors affecting compaction of soil. [5+5]

OR

7. Find the intensity of vertical pressure at a point 4m directly below a 20 kN point load acting at a horizontal ground surface. What will be the vertical pressure at a point 2 m horizontally away from the axis of loading but at the same depth of 4m and directly under the load at a depth of 3 m? [10]

8. A normally consolidated clay layer 2m thick is sandwiched between two sand layers. The average overburden stress at the middle of clay layer can be taken as 160kN/m^2. Due to construction of a structure there is an increase in effective vertical stress of 40kN/m^2 at the middle of clay layer. The liquid limit of clay layer is 60% and the initial void ratio is 0.9. Estimate the primary settlement. [10]

OR

9.a) Explain how you will determine void ratio of the sample by change in void ratio method. Also explain how do you find coefficient of volume change?
b) Explain square root of time fitting method for determination of coefficient of consolidation. [5+5]

10. Differentiate between conventional failure envelope and modified failure envelope with the neat sketches. Define stress path, and draw typical stress paths (TSP, TSSP, ESP) for a drained test and undrained test on normally consolidatd clay, and on over-consolidated clay. [10]

OR

11.a) Discuss Skempton's pore pressure parameters.
b) In a direct shear test the major and minor principal stresses were found to be 500 kN/m^2 and 300 kN/m^2, respectively. Determine the normal and shear stresses on a plane inclined at 30^0 to the major principal plane in a clock-wise direction. [5+5]

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, November/December - 2016
GEOTECHNICAL ENGINEERING
(Common to CE, CEE)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A
(25 Marks)

1.a) Define the terms (i) Degree of saturation (ii) air content (iii) relative density. [2]
b) List the common clay minerals and summarize their key properties . [3]
c) State Darcy's law. Explain the validity of Darcy's law. [2]
d) Describe the quick sand condition. [3]
e) Explain stress distribution in soils for concentrated loads by Boussinesq theory. [2]
f) Differentiate between (i) Standard Proctor test (ii) Modified Proctor test [3]
g) Define the terms 'Normally consolidated soils', coefficient of volume change', and 'coefficient of compressibility', [2]
h) What is the pre-consolidation pressure? [3]
i) Discuss the characteristics of Mohr's circle. [2]
j) Explain the classification of shear tests based on drainage conditions. [3]

PART - B
(50 Marks)

2.a) Explain the soil formation and soil types.
b) Explain the terms porosity, void ratio and degree of saturation 1 m^3 of wet soil weighs 20 kN. Its dry weight is 18 kN. Specific gravity of solids is 2.67. Determine the water content, porosity, void ratio and the degree of saturation. Draw a phase diagram. [5+5]

OR

3.a) An undisturbed saturated specimen of clay has a volume of 18.9 cm^3 and a mass of 30.2 g. on oven drying, the mass reduces to 18.0 g. the volume of dry specimen as determined by displacement of mercury is 9.9 cm^3. Determine shrinkage limit, specific gravity, shrinkage ratio and volumetric shrinkage.
b) Explain sensitivity, thixotropy and activity. The insitu void ratio of a granular soil deposit is 0.50. the maximum and minimum void ratios of the soil were determined to be 0.75 and 0.35. Gs= 2.67. Determine the relative density of the deposit. [5+5]

4.a) Explain Capillarity in soils. Calculate the approximate height of capillary rise in a soil having e = 0.75, D_{10} = 0.05 mm (assume C =25). What is the value of capillary tension?
b) A 5 m thick sand layer (Gs = 2.67, e = 0.6) is underlain by a bed of 4 m clay (γsat= 20 kN/m^3), plot the total, neutral and effective stress distribution upto the bottom of the clay layer, when (i) the water table is at 2 m below ground surface,(take, S= 50% above the water table) (ii) the water table is at the ground surface. (iii) the water table is 2 m above the ground surface. [5+5]

OR

5.a) What are the factors affecting permeability? A horizontal stratified deposit consists of three layers each uniform in itself. The permeability of the layers are 8×10^{-6} m/s, 50×10^{-6} m/s and 15×10^{-4} m/s and there thicknesses are 6 m, 3m and 18m respectively. Find effective average permeability of the deposit in horizontal and vertical direction.

b) Explain quick sand condition. Give the characteristics of Flow nets. [5+5]

6.a) A strip footing 3 m wide is loaded on the ground surface with a pressure at 100 kN/m^2. A 4m thick soft clay layer exits at a depth of 10 m below the foundation. Find the average increase in vertical stress at the clay layer under the centre line and edge of the building.

b) Explain Newmark's chart for finding vertical stresses. [5+5]

OR

7.a) During a compaction test, a soil attains MDD of 18.6 kN/m^3 at a moisture content of 15%. Taking specific gravity of soils as 2.7, find the degree of saturation and percentage air voids at MDD. What will be the dry density corresponding to zero air voids at OMC. How does compaction improve the engineering properties of soils?

b) An elevated structure with a total weight of 10,000 kN is supported on a tower with 4 legs. The legs rest on piers located at the corners of a square 6 m on a side. What is the vertical stress increment due to this loading at a point 7 m beneath the centre of the structure? Explain Westergaard's Equation. [5+5]

8.a) A 8 m thick clay layer with single drainage settles by 120 mm in 2 years. The coefficient of consolidation for this clay was found to be 6×10^{-3} cm^2/s. Calculate the likely ultimate consolidation settlement and find out how long it will take to undergo 90% of the settlement.

b) Explain Terzaghi's 1-D consolidation theory. [5+5]

OR

9.a) A clay soil, tested in a consolidometer, showed a decrease in void ratio from 1.20 to 1.10 when the pressure was increased from 0.25 to 0.50 kgf/cm^2. Calculate the coefficient of compressibility and the coefficient of volume compressibility. If the coefficient of consolidation determined in the test for the given stress increment was 10 m^2/ year, calculate the coefficient of permeability in cm/s. If the samples tested at the site was taken from a clay layer 3 m in thickness, determine the consolidation settlement resulting from the given stress increment.

b) Explain height of solids and change in void ratio method for computing equilibrium void ratio. [5+5]

10.a) Explain the stress-strain and volume change behaviour of sands.

b) Triaxial test carried out on a partially saturated clay gave c' = 20kN/m^2 and $\phi' = 22^0$. If the pore pressure parameters for the clay A and B were 0.45 and 0.8 respectively, calculate the pore pressures in a specimen of clay at the beginning and end of each of the two stages of one of the test. (i) Consolidation stage when the cell pressure was 150 kN/m^2 (ii) shear stage with a cell pressure raised to 300 kN/m^2. [5+5]

OR

11.a) In an insitu vane shear test on a saturated clay, a torque of 35 Nm 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. The vane was then rotated rapidly to cause remoulding of the soil. The torque required to shear the soil in the remoulded state was 5 Nm. Determine the sensitivity of the clay

b) Explain direct shear test and unconfined compression test. [5+5]

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, November - 2015
GEOTECHNICAL ENGINEERING
(Common to CE, CEE)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A (25 Marks)

1.a) Define liquid limit and plastic limit. [2]
b) Write about soil formation. [3]
c) Define total stress and effective stress. [2]
d) Write short notes on capillary rise. [3]
e) Write about isobar and pressure bulb diagrams. [2]
f) Write assumptions of Boussinesq's theory. [3]
g) Define normally consolidated and over consolidated soils. [2]
h) Write about stress history of clay using e-σ curves. [3]
i) Define dilatancy and critical void ratio. [2]
j) Write about demerits of direct shear test. [3]

PART - B (50 Marks)

2.a) Derive the relation between dry density, bulk density and water content.
b) A soil sample has a liquid limit of 70% and its plasticity index is 50 with a natural water content of 20%. Determine its liquidity index and describe its consistency. [5+5]

OR

3.a) Explain step by step procedure to classify fine grained soils.
b) A partially saturated sample has a moisture content of 15% and bulk unit weight of 21.5kN/m^3. The specific gravity of solids is 2.67. Determine dry unit weight, and saturated unit weight. [5+5]

4.a) Explain the laboratory procedure to determine coefficient of permeability by variable head method.
b) Determine the effective stress at a depth of 8 m below the ground level. The water table is at 3m below ground surface. The water content of the soil above water table is 10%. Take G=2.68, e = 0.6. Neglect capillary flow. [5+5]

OR

5.a) Write about properties and uses of flownets.
b) In a laboratory permeability test, the discharge of water collected from a constant head permeameter in a period of 10minutes is 200ml. The internal diameter of the permeameter is 6cm and the measured difference in head between two gauging points 15 cm vertically apart is 100cm. Calculate the coefficient of permeability. [5+5]

6.a) Explain the factors effecting compaction on soil properties.

b) A circular area of radius 2m carries a uniformly distributed load of 90kN/m^2. Determine the intensity of vertical pressure at 4m beneath the centre of the circle using Boussinesq's theory. [5+5]

OR

7.a) Write briefly about Newmark's Influence chart.

b) Using Boussinesq's theory, determine the vertical stress at a depth of 3m directly under the point load of 500kN acting at the surface of a soil mass and also at a horizontal distance of 4m. [5+5]

8.a) Explain Casagrande's logarithm of time fitting method to determine coefficient of consolidation.

b) A 20mm thick consolidometer clay sample reached 50% consolidation in 35minutes with double drainage. How long would it take for the clay layer from which this sample was obtained to reach 50% consolidation? The clay layer of 6m has single drainage. [5+5]

OR

9.a) Explain about preconsolidation pressure and its determination by Casagrande's method.

b) A clay layer of 5m thick has a settlement of 20mm when the stress was increased from 50kN/m^2 to 100kN/m^2. What will be the settlement if the stress is increased from 100kN/m^2 to 150kN/m^2 for the same clay layer. [5+5]

10.a) Explain about drainage conditions in Triaxial tests.

b) Write briefly about Mohr-Coulomb failure theory. [5+5]

OR

11.a) Discuss about shear strength of sands.

b) In an unconfined compression test, a sample of 7.5cm long and 3.5cm in diameter fails under a load of 90N at 10% strain. Compute the unconfined compressive strength and shear strength of the sample. [5+5]

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