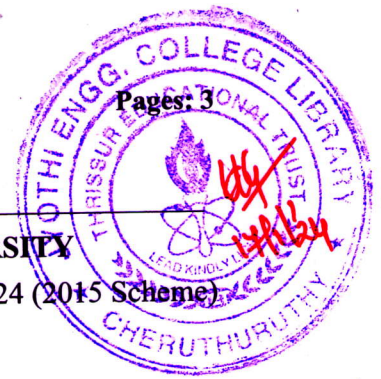


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S, FE) / S4 (PT) (S, FE) Examination January 2024 (2015 Scheme)



Course Code: CE208

Course Name: GEOTECHNICAL ENGINEERING I (CE)

Max. Marks: 100

Duration: 3 Hours

(Graph sheets may be supplied on request)

PART A

Answer any two full questions, each carries 15 marks

Marks

- 1 a) Define the terms: (i) Void ratio, (ii) Porosity, (iii) Degree of saturation, (iv) Water content, and (v) Air content 5
 - b) Derive the relationship between void ratio and porosity with the help of three phase diagram. 5
 - c) A soil specimen has a water content of 10% and a wet unit weight of 20 kN/m^3 . If the specific gravity of soil solids is 2.70, determine the dry unit weight, void ratio, and the degree of saturation. Take unit weight of water = 10 kN/m^3 . 5
 - 2 a) Explain the IS Classification of soil 8
 - b) The weight of a chunk of moist soil is 0.196 kN and its volume is 0.011 m^3 . After drying in the oven, the weight reduces to 0.162 kN. Determine: 7
 - i) Water content
 - ii) Unit weight of moist soil
 - iii) Dry unit weight
 - iv) Void ratio and
 - v) Degree of saturation
- Take $G = 2.7$ and Unit weight of water = 10 kN/m^3
- 3 a) Explain the terms (i) Sensitivity (ii) Thixotropy 5
 - b) Explain the procedure for conducting hydrometer analysis? Also mention the corrections applied to hydrometer readings and equations used. 10

PART B

Answer any two full questions, each carries 15 marks

- 4 a) Determine the average coefficient of permeability in the horizontal and vertical directions for a deposit consisting of three layers of thickness 5m, 1m, and 2.5 m and having the coefficients of permeability of 3×10^{-2} mm/sec, 3×10^{-5} mm/sec, and 4×10^{-2} mm/sec, respectively. Assume the layers are isotropic. 6
- b) A soil profile consists of a surface layer of clay 4m thick (unit weight = 19.5 kN/m^3) and a sand layer of 2m thick (unit weight = 18.5 kN/m^3) overlying an impermeable rock. The water table is at the ground surface. If the water level in a stand pipe driven into the sand layer rises 2m above the ground surface, draw the plot showing the variation of Total stress, porewater pressure and effective stress. Take $\gamma_w = 10 \text{ kN/m}^3$. 9
- 5 a) Differentiate between CU, CC and UU tests. 6
- b) Explain the detailed procedure of Direct shear test with the help of a neat diagram 9
- 6 a) A sand deposit consists of 2 layers. The top layer is 2.5m thick ($\gamma = 1709.67 \text{ kg/m}^3$) and the bottom layer is 3.5 m thick ($\gamma_{\text{sat}} = 2064.52 \text{ kg/m}^3$). The water table is at a depth of 3.5 m from the surface and the zone of capillary saturation is 1m above the water table. Draw the diagrams showing the variation of total stress, neutral stress, and effective stress. Take $\gamma_w = 1000 \text{ kg/m}^3$. 8
- b) Explain Mohr Coloumb Failure theory. 7

PART C

Answer any two full questions, each carries 20 marks

- 7 a) Explain the terms i) Coefficient of compressibility ii) Coefficient of volume compressibility iii) Compression index 6
- b) What is pre consolidation pressure? Explain the procedure for determining the consolidation pressure. 6
- c) Explain different Compaction control methods used 8
- 8 a) Explain the graphical methods for determining the coefficient of consolidation with neat sketches. 8

- b) Distinguish between normally consolidated, under consolidated, and over consolidated clays? 6
- c) A stratum of clay is 2m thick has an initial overburden pressure of 50 kN/m^2 at its middle. Determine the final settlement due to an increase in pressure of 40 kN/m^2 at the middle of the clay layer. The clay is over consolidated, with a preconsolidation pressure of 75 kN/m^2 . The values of coefficient of compression and compression index are 0.05 and 0.25 respectively. Take initial void ratio as 1.45. 6
- 9 a) Explain toe failure, base failure, and slip failure with suitable sketches 6
- b) How the stability of slopes does is analysed using friction circle method? 7
Explain with neat sketch.
- c) A vertical cut is made in a clay deposit ($c = 30 \text{ kN/m}^2$, $\phi = 0$, $\gamma = 16 \text{ kN/m}^3$). Find the maximum height of the cut which can be temporarily supported. $S_n = 0.261$ 7
