

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FOURTH SEMESTER B.TECH DEGREE EXAMINATION (R&S), MAY 2019

Course Code: CE208

Course Name: GEOTECHNICAL ENGINEERING (CE)



Max. Marks: 100

Duration: 3 Hours

(Graph sheets - ordinary as well as semi-log - may be supplied on request)

PART A

Answer any two full questions, each carries 15 marks

Marks

- 1 a) Void ratio of a soil decreases from 1.15 to 0.85 upon densification. What is the corresponding percentage decrease in volume? 6
- b) A soil sample is compacted to a bulk unit weight of 18kN/m^3 at 10% water content. Find the void ratio and degree of saturation of the soil. Also find the weight of water to be added to 100 m^3 of this soil for complete saturation. Assume $G=2.75$ 9
- 2 a) A clay has a liquid limit of 52% and shrinkage limit of 17%. If a specimen of this soil shrinks from a volume of 10000mm^3 at liquid limit to 6010 mm^3 at shrinkage limit determine the specific gravity of soil grains. 6
- b) Draw I.S. Plasticity chart and mark the details. What is its practical application? 9
- 3 a) Starting from the fundamentals, derive an expression for bulk unit weight in terms of air content, water content and percentage air voids. 8
- b) Why is a deflocculating agent correction needed for observed hydrometer reading? What is the nature of correction [positive or negative]? Mention a commonly used deflocculating agent. 7

PART B

Answer any two full questions, each carries 15 marks

- 4 a) Differentiate between critical hydraulic gradient and exit gradient. 6
- b) A sand deposit has: void ratio=0.85; $G=2.7$. WT is at 1.5m depth below GS and the soil above WT is also fully saturated due to capillarity. Determine the total, neutral and effective stress at 1.2m and 4.2m beneath the GS. 9
- 5 a) Minor and major principal stresses at failure for a sample of soil subjected to triaxial test are 150kPa and 536.6kPa respectively. Determine the angle of internal friction of this soil, if its cohesion is 25kPa . Also determine (i) the angle made by the failure plane with the horizontal; and (ii) direction of maximum 15

shear stress.

- 6 a) State any 4 merits of triaxial test over direct shear test. 6
- b) A permeameter of 80mm diameter contains a 2-layered soil sample of length 300mm (200mm thick soil having $k=4 \times 10^{-6}$ mm/sec. underlain by 100mm thick soil with $k=4 \times 10^{-7}$ mm/sec.) If a falling head permeability test is conducted on this soil with a standpipe of diameter 15mm., what would be the time taken the time taken for the head to fall from 500mm to 100mm? 9

PART C

Answer any two full questions, each carries 20 marks

- 7 a) The following observations were recorded in a consolidation test on a fully saturated sample. Initial height of sample= 20mm; diameter of sample=60mm; 20

| | | | | | | | |
|----------------------------|----|------|------|------|-----|------|------|
| Applied pressure (kPa) | 0 | 25 | 50 | 100 | 200 | 400 | 800 |
| Height of soil sample (mm) | 20 | 17.5 | 17.1 | 16.5 | 15 | 13.5 | 12.0 |

Dry weight of soil sample=76.34gms.; $G=2.7$; Draw e-log p graph and estimate compression index.

- 8 a) An embankment is constructed at dry density-OMC condition (20kN/m^3 and 9%). Borrow area soil has: $G=2.5$. Determine degree of saturation and percentage air voids of the compacted soil. Also determine the theoretical maximum dry density to which the sample can be compacted. Assume density of water $=10\text{kN/m}^3$. 14
- b) What is meant by factor of safety with respect to cohesion. When does it become equal to factor of safety with respect to shear strength? 6
- 9 a) How can the pre-consolidation pressure on clay be estimated? 10
- b) What are the forces considered in friction circle method of slope analysis? 10
- Suggest any 4 methods for improving the stability of a slope.
