Total No. of Questions : 8]

SEAT No. :

P-1479

[Total No. of Pages : 3

[6002]-106
S.E. (Civil)
GEOTECHNICAL ENGINEERING
(2019 Pattern) (Semester - IV) (201008)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if required.***
5) ***Use of non-programmable scientific calculator is allowed.***

Q1) a) Calculate the zero-air-void density for a soil with Gs = 2.70 at moisture contents of 5, 10, 15, 20, and 25%. Plot a graph of ZAV versus moisture content. **[6]**

b) A ring foundation is of 3.60 m external diameter and 2.40 m internal diameter. It transmits a uniform pressure of 135 kN/m^2. Calculate the vertical stress at a depth of 1.80 m directly beneath the centre of the loaded area. **[6]**

c) Explain the field application of compaction test result and how to control Field compaction. **[5]**

OR

Q2) a) List the factors affecting compaction and explain the effect of compaction on any four soil properties. **[6]**

b) A raft of size 4 m × 4 m carries a uniform load of 200 kN/m^2. Using the point load approximation with equivalent point loads for four equal squares, calculate the stress increment at a point in the soil which is 4 m below the centre of the loaded area. **[6]**

c) What is Isobar and Pressure bulb? Explain its significance. **[5]**

P.T.O.

Q3) a) Comment on Unconfined Compression test is special case of Triaxial Compression test. Explain Unconfined Compression test with respect drainage, soil suitability and time requirement. **[6]**

b) The following table gives data obtained from triaxial compression test conducted under undrained conditions on two specimens of same soil sample. The diameter and height are 40 mm and 80 mm respectively for both samples. Determine shear strength parameters analytically. **[6]**

Specimen	i	ii
Cell pressure (kN/m^2)	100	200
Deviator load at failure (N)	637	881
Increase in volume at failure (ml)	1.1	1.5
Axial Compression (mm)	5	7

c) Draw shear strength envelops for c-soils, φ-soils and c-φ soils. Explain Terzaghi's effective stress principle. **[5]**

OR

Q4) a) Explain Thixotropy, Sensitivity and Activity of clayey soils. **[6]**

b) From a direct shear test on an undisturbed soil, evaluate the undrained shear strength parameters. Determine shear strength, major and minor principal stresses and their planes in the case of specimen of same soil sample subjected to a normal stress of 100 kN/m^2. **[6]**

Normal stress (kN/m^2)	70	96	114
Shear stress at failure (kN/m^2)	138	156	170

c) Explain with neat sketch the Peak and Residual shear strengths of soils. **[5]**

Q5) a) Compare between assumptions and principle of Rankine's and Coulomb's theory of Earth pressure. **[6]**

b) For the retaining wall of 6 m height with vertical back, the top 3 m of the sand fill has unit weight of 16 kN/m^3 and $\varphi = 30°$ and the rest sand fill have saturated unit weight of 18 kN/m^3 and $\varphi = 35°$ with Groundwater table at 3m from bottom. Determine the force per unit length of the wall for Rankine's active state. Also find the location of the resultant. **[6]**

c) Explain with neat sketch Culmann's graphical method of determination of earth pressure. **[6]**

OR

Q6) a) Explain with neat sketches at rest, active and passive earth pressure with respect to wall movements. **[6]**

b) A retaining wall with a smooth vertical back retains a purely cohesive fill. Height of wall is 12 m. Unit weight of fill is 20 kN/m^3. Cohesion is 10 kN/m^2. Show pressure distribution, at what depth is the intensity of pressure zero. What is the total active Rankine thrust on the wall? where does the resultant thrust act? **[6]**

c) Explain with neat sketch Rebhann's graphical method of determination of earth pressure. **[6]**

Q7) a) Explain with neat sketch stability analysis of Infinite Slopes in c-φ soil. **[6]**

b) An embankment 10 m high is inclined at an angle of 36° to the horizontal A stability analysis by the method of slices gives the forces per running meter: Σ Shearing forces = 450 kN, Σ Normal forces = 900 kN, Σ Neutral forces = 216 kN. The length of the failure arc is 27 m. The soil has the effective values c' =20 kN/m^2 and φ = 18°. respectively. Determine the factor of safety of the slope with respect to (a) shearing strength and (b) cohesion. **[6]**

c) Explain Friction Circle Method with neat sketch. **[6]**

OR

Q8) a) Explain Landslides causes and remedial measures. **[6]**

b) An embankment is inclined at an angle of 35° and its height is 15 m. The angle of shearing resistance is 15° and the cohesion intercept is 200 kN/m^2. The unit weight of soil is 18 kN/m^3. If Taylor's stability number is 0.06, find the factor of safety with respect to cohesion. **[6]**

c) Explain Bishop's method of stability analysis with neat sketch. **[6]**

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