K-128

Total No. of Pages :3

Seat No.	

T.E. (Civil) (Semester - V) (Revised) Examination, 2013

GEOTECHNICAL ENGINEERING - I

Sub.Code : 45537

Day and Date : Wednesday, 05 - 06 - 2013 **Total Marks : 100**

Time : 10.00 a.m. to 1.00 p.m.

Instructions: 1) **Question I from Section -I and quetion 5 from Section - II are compulsory. attempt ANY TWO other questions from each of the sections.**

2) **Figures to the right indicate marks.**

3) **ASSUME suitable data if necessary and state the assumption made clearly**

4) **Graph sheets will be provided on request.**

5) **Use of *NON-PROGRAMMBLE* calculator is *allowed*.**

SECTION - I

Q1) Answer the following **(compulsory):**

a) Prove that $\gamma_{sat} = \frac{e}{w}\left\{\frac{1+w}{1+e}\right\}\gamma_w$ **[4]**

b) Differentiate between Discharge velocity and Seepage velocity. **[6]**

c) Define : 1) Plastic Limit. ii) Shrinkage Limit. **[4]**

d) Explain the working of Proctor's Needle. **[6]**

Q2) a) A clay has liquid limit = 52% plastic limit = 30% and shrinkagelimit = 18%. If the sample shrinks from a volume of 39.5cm^3 at liquid limit to 24.2cm^3 at shrinkage limit, calculate the true specific gravity of the soil. **[10]**

b) Explain the process of pretreatment of a soil sample on which sedimentation analysis is to be performed in the laboratory. **[5]**

P.T.O.

Q3) a) Enlist the methods of determining permeability of soil samples in the laboratory. Explain ANY one of the methods used in the laboratory. **[6]**

b) A constant head permeability test was conducted on a cylindrical specimen of 10cm diameter and 15cm height. 160cm^3 of water was collected in 1.75 minutes under a head of 30cm. compute coefficient of permeability, "k" in m/year and velocity of flow in m/sec. If porosity of the sample is 40% calculate the seepage velocity. **[9]**

Q4) a) Differentiate between Compaction and Consolidation. **[5]**

b) Difine Relative Compactness. **[3]**

c) A saturated clay layer,5m thick, lies under a newly constructed building. The effective pressure due to overlying strata on clay layer is 300 kN/m^2. The new construction increases the effective pressure by 120 kN/m^2. If comnpression index(C_c) of the clay is 0.45, compute settlement in clay layer because of the new building. Given, w = 43% & G = 2.7. **[7]**

SECTION - II

Q5) Answer the following **(compulsory):**

a) Write Boussinesq's equation for uniform vertical loading on an infinite strip to find $\sigma_z, \sigma_x, \& \tau_{xz}$ at a point P located horizontally x units away & vertically z units below the midpoint of the strip. **[6]**

b) Draw a typical Mohr's circle of stress and show on it the location of major principal plane & minor principal plane. **[4]**

c) With the help of a sketch explain the following. **[6]**

i) cell pressure ii) deviator stress iii) major principle stress

d) Explain with the help of a sketch **[4]**

i) active earth pressure & ii) passive earth pressure.

Q6) a) Compare Boussinesq's theory & Westergaard's theory for determining stresses within a soil mass due to surface loading. **[5]**

b) A square footing 2m × 2m carries an u.d.l. of 314 kN/m^2. Find σ_z at 4m depth below a point 0.5m inside each of the two adjacent sides of the footing. Use equivalent point load method. **[10]**

Q7) a) A CU test was conducted on a sample with cell pressure = 100 kN/m^2 & σ_d = 60 kN/m^2. The soil has c = 0 kN/m^2, $\phi = 30^0$ (w.r.t. effective stresses) and c_u = 0 kN/m^2 & $\phi_u = 13.3^0$ (w.r.t. total stresses). What was the pore pressure at failure? **[8]**

b) Two triaxial tests were conducted on a material. In the first test failure occurred at σ_d = 750 kN/m^2 & a cell pressure of 250 kN/m^2 . In the other test cell pressure was 400 kN/m^2 and failure occurred at a total pressure of 1600 kN/m^2. Determine the shear parameters c & ϕ. **[7]**

Q8) a) What are k_0, k_a & kp ? give expressions for calculating them. **[6]**

b) Compute the active earth pressure at a depth of 4.5 m in a sand whose $\phi = 37^0$, under following conditions: **[9]**

i) If γ_b of sand = 15.3 kN/m^3.

ii) If WT is located at a depth of 1.5 m below GL. Take γ_{sub} of sand = 9.66 kN/m^3.

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