Code No: NR310105 **NR**

**III B.Tech I Semester Supplementary Examinations, November 2006**
**GEOTECHNICAL ENGINEERING**
**(Civil Engineering)**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

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1. (a) Define Porosity and Void ratio.
   (b) By three phase diagram show that the degree of saturation can be expressed interms of mass unit weight $\gamma$, water content w and specifi gravity of soil grains G, and unit weight of water.
   (c) A soil sample weighing 16 KN/$m^3$ has water content of 32%. The Specific gravity of soil particle is 2.65. Determine
      i. Void ratio
      ii. Porosity
      iii. Degree of saturation. [4+6+6]

2. (a) On sieve analysis it has been found that the soil contains 55% material passing 75 micron sieve. The liquid limit and plastic limit of soil are 40% and 15% respectively. Findout the group index of soil and hence comment on the suitability of soil as subgrade material. [8]
   (b) A wet weight of soil sample having a volume of 44.8 X$10^3$ $mm^3$ is 85 g (0.85N). After overn drying the weight reduces to 76 g ( 0.76N). Find out degree of saturation if G=2.72. What would be the water content at full saturation. [8]

3. (a) What are the factors affecting the permeability of soil? Explain. [8]
   (b) A constant head permeability test has been carried out on a soil sample, 10 cm in diameter and 15 cm long. With a hydraulic head of 30 cm, 300 c.c of water has been collected in 15 minutes time. Compute the coefficient of permeability of soil. [8]

4. (a) What is quick sand? Derive an expression for critical hydraulic graduicut. [8]
   (b) The ground water level in a deposit of fine sand is 1.5 m below ground level. Above the water table, the sand is saturated with capillary water. The bulk unit weight of sand is 21 kN/$m^3$. Calculate the total stress, the neutral stress and the effective stress at a depth of 1 m from the ground level. [8]

5. (a) Derive the expression for vertical pressure under strip load.
   (b) The uniform intensity of loading at the foundation level of a building is 10m in width and very great extent in length, with the intensity of loading of 100 kN/$m^2$. Using Newmark's chart, find the vertical stress at the depth of 1m under the center line and the edge of the building. Check your answers by analytical solution. [8+8]

6. (a) Write a brief note on 'Proctor's Needle'. [4]
   (b) Derive an expression for 'zero- air -void line' and draw the line for a specific gravity of 2.65. [4]
   (c) Draw typical compaction curves for:
      i. well graded gravel with sand,
      ii. sandy clay, and
      iii. silty clay [8]

7. (a) Distinguish between normally consolidated and overconsolidated soils. [4]
   (b) Explain in detail any one method for determining the coefficient of consolidation of soil. [4]
   (c) The void ratio of a clay is 1.56, and its compression index is found to be 0.8 at Pressure of 180 kN/m$^2$. What will be the void ratio if the pressure is increased To 240 kN/m$^2$? [8]

8. (a) What are the advantages and disadvantages of direct shear test over triaxial test? [8]
   (b) Derive the equation relating Skempton's pore pressure parameters with the increments of pore pressure, major and minor principal stresses. [8]

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