

**III B.Tech I Semester Supplementary Examinations, May 2005**  
**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) Explain how do use particle size distribution curve to classify the soil.  
 (b) Explain how shrinkage limit test is conducted in the laboratory.  
 (c) A clay sample has a volume  $18 \times 10^{-6} \text{ m}^3$  and weighs 30.8 g ( $30.8 \times 10^{-2} \text{ N}$ ). On oven drying its volume and weight are 12.5g ( $12.5 \times 10^{-2} \text{ N}$ ) and 20.5 g ( $20.5 \times 10^{-2} \text{ N}$ ). Compute Specific gravity and Shrinkage ratio.
2. (a) Differentiate between :
  - i. Liquid limit and Plastic Limit
  - ii. Plasticity and consistency
  - iii. Liquidity index and consistency index
  - iv. Flow index and toughness index.
 (b) A sample has plastic limit 15% and field moisture content is 20% using this soil, labnoratory liquid limit test was carried out giving the following values:
 

No of blows ( N )	38	27	20	13
Water content %	47.5	49.5	51.9	53.9

 Determine
  - i. Liquid limit
  - ii. Toughness index
  - iii. Plasticity index
  - iv. flow index
3. (a) Derive the expressions for the average coefficient of permeability of stratified soil deposits
  - i. Parallel to the bedding planes and
  - ii. Perpendicular to the bedding planes.
 (b) A field pumping out test gave the following data:  
 Diameter of well = 0.2 m  
 Thickness of confined aquifer = 30 m  
 Radius of circle of influence = 350 m  
 Draw-down during the test = 5 m  
 Pump discharge = 0.8 cumecs.  
 Compute the permeability of the aquifer.
4. (a) Derive the Laplace equation for two dimensional flow.

- (b) The surface of saturated clay deposit is located permanently below the body of water. The average natural water content of clay is 50% and specific gravity of soil solids is 2.72. Calculate the inter granular pressure at a depth of 8 m below the surface of clay layer.
5. (a) Explain
- Contact pressure distribution with respect to flexible and rigid footing.
  - Pressure bulb
  - New marks chart
- (b) A concentrated load of 10MN is applied at the ground surface. Compute the vertical stress
- at a depth of 5 m below the load.
  - At a distance of 4m at the same depth.
6. (a) Explain the difference between compaction and consolidation.
- (b) Proctor compaction test was conducted on a soil sample, and the following observations were made:
- |                        |     |      |      |      |      |      |
|------------------------|-----|------|------|------|------|------|
| Water content, %       | 7.7 | 11.5 | 14.6 | 17.5 | 19.5 | 21.2 |
| Weight of wet soil, kg | 1.7 | 1.89 | 2.03 | 1.99 | 1.96 | 1.92 |
- If the volume of the mould used was 950cc and the specific gravity of soil was 2.65, Make necessary calculations and draw
- compaction curve and
  - 80% saturation line
7. (a) Obtain the differential equation defining the one-dimensional consolidation as given by Terzaghi.
- (b) In a consolidation test, the following results have been obtained. When the load was changed from 50 kN/m<sup>2</sup> to 100 kN/m<sup>2</sup>, the void ratio changed from 0.70 to 0.65. Determine the coefficient of volume decrease, and the compression index.
8. (a) What are the advantages and disadvantages of direct shear test over triaxial test?
- (b) Derive the equation relating Skempton's pore pressure parameters with the increments of pore pressure, major and minor principal stresses.

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