Code No: 07A60101 **R07** **Set No. 2**

III B.Tech II Semester Examinations,December 2010
GEOTECHNICAL ENGINEERING-I
Civil Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the methods of finding the placement density of a compacted fill. Name the method which is suitable for all types of soils.
   (b) What effect does increased compaction energy have on the properties of a granular soil? [8+8]

2. (a) Explain the determination of average coefficient of permeability in the horizontal and vertical directions for a soil deposit consisting of a number of layers.
   (b) The end of clean glass tube is inserted in pure water. What is the height of capillary rise, if the tube is
      i. 0.1 mm, and
      ii. 0.001 mm in diameter? [12+4]

3. Differentiate between unconsolidated undrained test and drained test. Under what conditions are these test results used for design purposes? [16]

4. A very long embankment is to be built with a top width of 10m and side slopes of 1: 1 $^1/_2$. The height of the embankment is 10m. Compute the vertical stresses at a depth of 5m from the base at the following points.
   (a) Below the toe
   (b) Below the central line
   (c) Below a point midway on the slope.
   Assume, $\gamma = 21$ KN/m^3. [16]

5. (a) Define: total stress, effective stress and neutral stress as applied to soils.
   (b) What are the corrections to be made to the phreatic line? And how the same is carried out.
   (c) What is a flow net? State its properties and applications. What is the quantity of seepage between two successive flow lines and equipotential lines? [4+4+8]

6. (a) With the help of sketches explain the following:
      i. well graded soil,
      ii. uniformly graded soil,
      iii. gap graded soil.

(b) The Atterberg limits of a soil sample are: liquid limit = 50%, plastic limit = 30% and shrinkage limit = 15%. If the specimen of this soil shrinks from a volume of 10 cm^3 at liquid limit to 5.94 cm^3 when oven dried, calculate the shrinkage ratio and specific gravity of soil solids. [8+8]

7. Compute the compression index of the soil from the following experimental data:

Load (kN/m^2	0	10	50	100	200	400	0
h(mm)	0	-0.7	-2.18	-0.070	-0.72	-0.85	+0.75

The initial thickness of the sample was 20mm, the specific gravity of soil particles is 2.70, and the final water content of the soil is 38.2%, also determine the pre-consolidation pressure of the soils. [16]

8. (a) What effect does the structure of clay have on the physical properties of soils?

(b) A soil deposit has a void ratio of 0.9 and the specific gravity of solids is 2.67. Determine the bulk unit weight if:

i. degree of saturation is 100% and

ii. degree of saturation is 90%. [8+8]

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Code No: 07A60101 **R07** **Set No. 4**

III B.Tech II Semester Examinations,December 2010
GEOTECHNICAL ENGINEERING-I
Civil Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Discuss the essential differences between Boussinesq's and Westergaard's theories. For which condition do both these theories yield approximately the same value of vertical stress. [16]

2. (a) How do you determine the permeability of a clayey soil in the laboratory? Derive the formula you use.
   (b) Estimate the quantity of flow of water through a soil mass in a 300 sec period when a constant head of 1m is maintained. The length of the sample is 150 mm and the cross sectional area is 100×100 mm. The coefficient of permeability of the soil sample is 1×10^{-1} mm/s. [10+6]

3. What are the factors that effect compaction? Discuss in detail with illustration sketches. [16]

4. A sample of dense sand is tested in the following tests:
   (a) Direct shear with a normal stress of 150KN/m^2.
   (b) Triaxial shear with a confining pressure of 150 KN/m^2.
   Find the maximum shear stress at failure in both the cases if the angle of internal fiction of the sand is 36^0. Explain your results with the Mohr-coulomb envelope. [16]

5. What is coefficient of consolidation? What is its use in the settlement analysis? How is it determined? [16]

6. (a) Describe the various corrections that are applied to the observed hydrometer readings. How they are determined.
   (b) What is plasticity chart? Explain its use in soil classification. [10+6]

7. (a) Establish the relationship between void ratio, water content, degree of saturation and dry unit weight.
   (b) The natural dry unit weight of sand is 17.5 kN/m^3. Find the relative density if the maximum dry unit weight is 18.5 kN/m^3 and the minimum dry unit weight is 16.0 kN/m^3. Take the specific gravity of solids to be 2.65. [8+8]

8. (a) Explain the principle of drawing flow nets and derive the expression to calculate the amount of flow of water in the case of sheet pile wall with a head of water 'h' on one side.

(b) Write short notes on neutral stress and effective pressure. What is the role of effective stress in soil mechanics? [10+6]

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Code No: 07A60101 **R07** **Set No. 1**

III B.Tech II Semester Examinations,December 2010
GEOTECHNICAL ENGINEERING-I
Civil Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. The following results were obtained from a direct shear test on a sandy clay sample.

Normal Load (N)	Shear load providing ring reading (division)
360	13
720	19
1080	26
1440	26

If the shear box is 60mm square and the proving ring constant is 20N per division, estimate the shear strength parameters of the soil. Would failure occur on a plane within this soil at a point. Where the normal stress is 320KN/m^2 and the corresponding shear stress is 138 KN/m^2. [16]

2. (a) What is quick sand condition? Derive the expression for the critical hydraulic gradient.
   (b) Explain the graphical procedure of drawing the phreatic line in a homogeneous earth dam provided with a toe drain. [6+10]

3. (a) State Stoke's law and explain its limitations as applicable to the sedimentation analysis.
   (b) The following results were obtained from the liquid limit test:

Number of blows	55	46	32	22	15
Water content (%)	24	30	35	41	49

Find the liquid limit. Also determine plasticity index, liquidity index, and constituency index if plastic limit and natural water content of soil were 24% and 32% respectively. [6+10]

4. (a) Differentiate between compaction and consolidation.
   (b) Describe a suitable method of determining the compression index of a soil. [8+8]

5. (a) A square foundation (4m × 4m) is to carry a load of 4200 KN. Calculate the vertical stress at a depth of 5.0m below the centre of the foundation. I_N = 0.084 for m = n = 0.50.
   (b) An excavation 3m × 6m for foundation is to be made to a depth of 2.5m below ground level in a soil of unit weight 20 KN/m^3. What effect this excavation will have on the vertical pressure at a depth of 6m measured from the ground

surface vertically below the centre of foundation? I_N for m = 0.43 and n = 0.86 is 0.10. [8+8]

6. (a) What is meant by weathering? Describe its agents, process and effects on rocks.

   (b) A natural soil deposit has a bulk unit weight of 19 kN/m^3 and water content of 5%. Estimate the amount of water required to be added to 1 m^3 of soil to raise the water content to 15%. Assume the void ratio to remain constant. The specific gravity of solids is 2.67. [8+8]

7. (a) Define the coefficient of permeability. Derive the expression for coefficient of permeability used in variable head permeability test.

   (b) A constant head permeability test was conducted on a sand sample of 250 mm length and 2000 mm^2 in area. The head loss was 500 mm and the discharge was found to be 260 ml in 130 sec. Determine the coefficient of permeability of the sand sample. Find the superficial and seepage velocities if the dry unit weight and specific gravity of the sample were 17.98 kN/m^3 and 2.62, respectively. [8+8]

8. The details of two borrow areas indentified for the construction of an embankment are given below.

Borrow area	Bulk density (g/cc)	Moisture content (%)	Specific gravity
A	1.65	14.5	2.65
B	1.30	15.6	2.67

The borrow areas are approximately at the same distance. The embankment is of length 1km, top width 8m, height 6m and side slopes 1:1.6. Which of the above two borrow areas would you recommend? State the Reason. [16]

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Code No: 07A60101 **R07** **Set No. 3**

III B.Tech II Semester Examinations,December 2010
GEOTECHNICAL ENGINEERING-I
Civil Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Discuss the factors that influence the value of coefficient of permeability of a soil.
   (b) A soil sample 90 mm high and 6000 mm^2 in cross-section was subjected to a falling head permeability test. The head fall from 500 mm to 300 mm in 1500 sec. The permeability of the soil was 2.4×10^{-3} mm/s. Determine the diameter of the stand pipe. [8+8]

2. (a) Distinguish between mechanical weathering and chemical weathering.
   (b) Derive from fundamentals: $\gamma_{sat} = \frac{(G+e)\gamma_w}{(1+e)}$ [8+8]

3. (a) State the assumptions made in Terzaghi's theory of one dimensional consolidation.
   (b) Define the terms compression index, coefficient of consolidation, and coefficient of compressibility and indicate their units and symbols. [8+8]

4. (a) Define the following:
      i. flow index,
      ii. liquidity index,
      iii. plasticity index,
      iv. toughness index,
      v. consistency index, and
      vi. shrinkage limit.
   (b) In a hydrometer analysis 0.5 N of soil was mixed in water to form one liter of uniform suspension. The corrected hydrometer reading after a lapse of 60 min from the start of sedimentation was 10, and the corresponding effective depth was 10.8 cm. The grain specific gravity was 2.72. Assuming the viscosity of water as 0.001 N-sec/m^2 and unit weight of water as 9.8 kN/m^3, determine the diameter and percentage finer corresponding to 60 min. [6+10]

5. (a) State various methods used to construct the flow net and describe any one method.
   (b) The water table in a certain area is at a depth of 2 m below the ground surface level. The soil of 10m depth consists of very fine sand having an average porosity of 0.40 and G = 2.67. Above the water table, the sand is saturated by capillary water for 1 m thickness. Calculate and show the total, effective and neutral stress diagrams at a depth of 0m, 0.30m and 5m from

the surface.

[8+8]

6. What are the various factors that effect the compaction of soil in the field? How will you measure compaction in the field? Describe a method with its limitations? [8+4+4]

7. A rectangular foundation 20 m × 10 m subjects the subgrade to a contact pressure of 250 kN/m^2. Determine the vertical stress at a point 'P' located at a depth of 5m as shown in figure 7. [16]

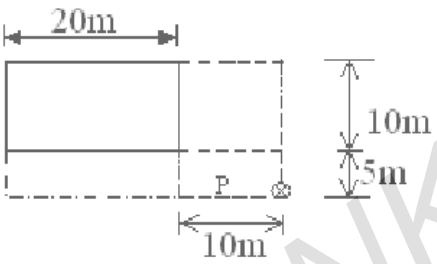

Figure 7

8. (a) Define critical void ratio. Explain the shear behavior of a soil whose void ratio is less than the critical void ratio.

   (b) Explain how a negative pore water pressure develops in a consolidated - undrained test on a over-consolidated clay. [8+8]

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