Code No: R05320101 | R05 | | Set No. 2 |

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

Time: 3 hours   Max Marks: 80

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

1. (a) Define the terms porosity, air content and percent air voids and derive the relationship between them.

   (b) A soil sample whose water content is 20% has a bulk unit weight of 21.6 kN/m^3. The sample undergoes air drying with an insignificant change in the void ratio. What is the water content of this sample when its bulk unit weight is reduced to 20.0 kN/m^3?   [8+8]

2. The results of a C$\overline{U}$ test on a compacted soil are given below

Sample No	σ_3(KN/m^2)	$(\sigma_1\text{-}\sigma_3)$ (KN/m^2)	u(KN/m^2)
1	70	230	-20
2	350	550	+90

   Determine the cohesion intercept and the angel of shearing resistance in terms of

   (a) Total stress

   (b) Effective stress.   [16]

3. Obtain the differential equation defining the one-dimensional consolidation as given by Terzaghi's theory.   [16]

4. (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]

5. (a) Explain the following:
      i. Seepage force,
      ii. Critical hydraulic gradient,
      iii. Flow net.

   (b) A soil profile consists of a surface layer of sand 3 m thick ($\gamma = 16$ kN/m^3), an intermediate clay layer 2 m thick ($\gamma_{sat} = 19.50$ kN/m^3), and a bottom layer of gravel 4 m thick ($\gamma_{sat} = 19$ kN/m^3). The water table is at the top of clay layer. Draw total, effective and neutral pressure diagrams when a surcharge of 50 kN/m^2 acts at the surface.   [6+10]

1

R05 **Set No. 2**

6. (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]

7. (a) A circular area of 7.5 meters in diameter on the ground surface carries a uniformly distributed load 4 kN/m^2. Find the intensity of vertical pressure below the centre of the loaded area at a depth of 5 meters below the ground surface. Use Boussinesq's analysis.

   (b) Write the assumptions of Boussinesq's theory for concentrated force. [8+8]

8. A moist soil sample compacted into a mould of 1000 cm^3 capacity and weight 35 N, weights 53.2N with the mould. A representative sample of soil taken from it has an initial weight of 0.185N and oven dry weight of 0.1690N. Determine

   (a) Water content

   (b) Wet density

   (c) Dry density

   (d) Void ratio

   (e) Degree of saturation. [16]

⋆ ⋆ ⋆ ⋆ ⋆

R05 **Set No. 4**

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

Time: 3 hours   Max Marks: 80

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

1. Obtain the differential equation defining the one-dimensional consolidation as given by Terzaghi's theory.   [16]

2. (a) Define the terms porosity, air content and percent air voids and derive the relationship between them.

   (b) A soil sample whose water content is 20% has a bulk unit weight of 21.6 kN/m^3. The sample undergoes air drying with an insignificant change in the void ratio. What is the water content of this sample when its bulk unit weight is reduced to 20.0 kN/m^3?   [8+8]

3. The results of a $C\overline{U}$ test on a compacted soil are given below

Sample No	$\sigma_3(KN/m^2)$	$(\sigma_1-\sigma_3)$ (KN/m^2)	$u(KN/m^2)$
1	70	230	-20
2	350	550	+90

   Determine the cohesion intercept and the angel of shearing resistance in terms of

   (a) Total stress

   (b) Effective stress.   [16]

4. A moist soil sample compacted into a mould of 1000 cm^3 capacity and weight 35 N, weights 53.2N with the mould. A representative sample of soil taken from it has an initial weight of 0.185N and oven dry weight of 0.1690N. Determine

   (a) Water content

   (b) Wet density

   (c) Dry density

   (d) Void ratio

   (e) Degree of saturation.   [16]

5. (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]

3

6. (a) A circular area of 7.5 meters in diameter on the ground surface carries a uniformly distributed load 4 kN/m^2. Find the intensity of vertical pressure below the centre of the loaded area at a depth of 5 meters below the ground surface. Use Boussinesq's analysis.

   (b) Write the assumptions of Boussinesq's theory for concentrated force. [8+8]

7. (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]

8. (a) Explain the following:

      i. Seepage force,
      ii. Critical hydraulic gradient,
     iii. Flow net.

   (b) A soil profile consists of a surface layer of sand 3 m thick ($\gamma = 16$ kN/m^3), an intermediate clay layer 2 m thick ($\gamma_{sat} = 19.50$ kN/m^3), and a bottom layer of gravel 4 m thick ($\gamma_{sat} = 19$ kN/m^3). The water table is at the top of clay layer. Draw total, effective and neutral pressure diagrams when a surcharge of 50 kN/m^2 acts at the surface. [6+10]

⋆ ⋆ ⋆ ⋆ ⋆

R05 **Set No. 1**

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

Time: 3 hours

Max Marks: 80

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

1. (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]

2. A moist soil sample compacted into a mould of 1000 cm³ capacity and weight 35 N, weights 53.2N with the mould. A representative sample of soil taken from it has an initial weight of 0.185N and oven dry weight of 0.1690N. Determine

   (a) Water content
   (b) Wet density
   (c) Dry density
   (d) Void ratio
   (e) Degree of saturation. [16]

3. (a) Discuss the factors that influence the value of coefficient of permeability of a soil.

   (b) A soil sample 90 mm high and 6000 mm² 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]

4. (a) A circular area of 7.5 meters in diameter on the ground surface carries a uniformly distributed load 4 kN/m². Find the intensity of vertical pressure below the centre of the loaded area at a depth of 5 meters below the ground surface. Use Boussinesq's analysis.

   (b) Write the assumptions of Boussinesq's theory for concentrated force. [8+8]

5. (a) Explain the following:
      i. Seepage force,
      ii. Critical hydraulic gradient,
      iii. Flow net.

(b) A soil profile consists of a surface layer of sand 3 m thick ($\gamma = 16$ kN/m^3), an intermediate clay layer 2 m thick ($\gamma_{sat} = 19.50$ kN/m^3), and a bottom layer of gravel 4 m thick ($\gamma_{sat} = 19$ kN/m^3). The water table is at the top of clay layer. Draw total, effective and neutral pressure diagrams when a surcharge of 50 kN/m^2 acts at the surface. [6+10]

6. The results of a C$\overline{U}$ test on a compacted soil are given below

Sample No	σ_3(KN/m^2)	(σ_1-σ_3) (KN/m^2)	u(KN/m^2)
1	70	230	-20
2	350	550	+90

Determine the cohesion intercept and the angel of shearing resistance in terms of

(a) Total stress

(b) Effective stress. [16]

7. Obtain the differential equation defining the one-dimensional consolidation as given by Terzaghi's theory. [16]

8. (a) Define the terms porosity, air content and percent air voids and derive the relationship between them.

(b) A soil sample whose water content is 20% has a bulk unit weight of 21.6 kN/m^3. The sample undergoes air drying with an insignificant change in the void ratio. What is the water content of this sample when its bulk unit weight is reduced to 20.0 kN/m^3? [8+8]

$\star\star\star\star\star$

Code No: R05320101　　　　**R05**　　　　**Set No. 3**

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

Time: 3 hours　　　　　　　　　　　　　　　　　　　Max Marks: 80

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

1. (a) Define the terms porosity, air content and percent air voids and derive the relationship between them.

   (b) A soil sample whose water content is 20% has a bulk unit weight of 21.6 kN/m^3. The sample undergoes air drying with an insignificant change in the void ratio. What is the water content of this sample when its bulk unit weight is reduced to 20.0 kN/m^3? [8+8]

2. The results of a $C\overline{U}$ test on a compacted soil are given below

Sample No	$\sigma_3(KN/m^2)$	$(\sigma_1\text{-}\sigma_3)$ (KN/m^2)	u(KN/m^2)
1	70	230	-20
2	350	550	+90

   Determine the cohesion intercept and the angel of shearing resistance in terms of

   (a) Total stress

   (b) Effective stress. [16]

3. (a) Explain the following:
      i. Seepage force,
      ii. Critical hydraulic gradient,
      iii. Flow net.

   (b) A soil profile consists of a surface layer of sand 3 m thick ($\gamma = 16$ kN/m^3), an intermediate clay layer 2 m thick ($\gamma_{sat} = 19.50$ kN/m^3), and a bottom layer of gravel 4 m thick ($\gamma_{sat} = 19$ kN/m^3). The water table is at the top of clay layer. Draw total, effective and neutral pressure diagrams when a surcharge of 50 kN/m^2 acts at the surface. [6+10]

4. (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]

5. A moist soil sample compacted into a mould of 1000 cm^3 capacity and weight 35 N, weights 53.2N with the mould. A representative sample of soil taken from it has an initial weight of 0.185N and oven dry weight of 0.1690N. Determine

7

(a) Water content

(b) Wet density

(c) Dry density

(d) Void ratio

(e) Degree of saturation.   [16]

6. (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]

7. Obtain the differential equation defining the one-dimensional consolidation as given by Terzaghi's theory.   [16]

8. (a) A circular area of 7.5 meters in diameter on the ground surface carries a uniformly distributed load 4 kN/m^2. Find the intensity of vertical pressure below the centre of the loaded area at a depth of 5 meters below the ground surface. Use Boussinesq's analysis.

   (b) Write the assumptions of Boussinesq's theory for concentrated force.   [8+8]

$\star\star\star\star\star$