Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE- V$^{th}$ SEMESTER–EXAMINATION – MAY/JUNE - 2012**

**Subject code: 150604** **Date: 05/06/2012**

**Subject Name: Geotechnical Engineering-I**

**Time: 02:30 pm – 05:00 pm** **Total Marks: 70**

## Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

**Q.1** **(a)** State the assumption made in Terzaghi's theory on one dimensional consolidation. Explain laboratory test for consolidation. **07**

**(b)** A laboratory specimen of clay 30 mm thick drained at top as well as bottom, has taken 400 second to reach 40% consolidation. When the pressure increased from 80 kN/m$^2$ to 160 kN/m$^2$. The initial void ratio was 0.85 and the final void ratio due to increasing of the load was 0.50. Determine coefficient of permeability. **07**

**Q.2** **(a)** (i) Explain Mohr's failure criterion. **07**

(ii) Explain Mohr's – Coloumb failure theory.

**(b)** The following results were obtained from undrained shear box test on soil. **07**

| | | | |
|---|---|---|---|
| Normal load (N) | 250 | 500 | 750 |
| Failure load (N) | 320 | 400 | 610 |

Determine strength parameter in terms of total stress. The cross-sectional area of shear box was 36 cm$^2$.

**OR**

**(b)** Two identical specimen of soil were tested in the triaxial test apparatus. First specimen failed at deviator stress 700 kN/m$^2$. When the cell pressure was 180 kN/m$^2$ second specimen failed at deviator stress 1300 kN/m$^2$ under cell pressure 360 kN/m$^2$. Determine value of c and φ analytically. If the same soil specimen tested in direct shear apparatus with normal stress 560 kN/m$^2$, determine shear stress at failure. **07**

**Q.3** **(a)** How compaction will affect the various properties of soil. **07**

**(b)** The in-situ void ratio of granular soil deposit is 0.45. The maximum void ratio and minimum void ratio of soil were determined to be 0.8 and 0.3, $G_s$ = 2.65. Determine the relative density and relative compaction deposit. **07**

**OR**

**Q.3** **(a)** Derive and state assumption of Laplace – 2D flow equation. **07**

**(b)** Briefly explain various factors affecting permeability of soil. **07**

**Q.4** **(a)** Distinguish between physical disintegration and chemical disintegration in process of formation of soil. **07**

**(b)** (i) Which are the limitations of sedimentation analysis? **07**

(ii) A sample of sand has volume of 1600 ml in natural condition. When it compacted volume found 1400 ml. When it pored in cylinder gently observed volume is 2200 ml. Determine relative density.

**OR**

**Q.4** **(a)** Draw phase diagram of soil. Define following terms: **07**

(i) void ratio (ii) porosity (iii) air content (iv) water content

**(b)** Derive the relation between (i) void ratio and water content (ii) mass **07**

density and water content

| | | | |
|---|---|---|---|
| **Q.5** | **(a)** | Explain Indian soil classification system. | **07** |
| | **(b)** | What do you understand by consistency of soil? How is it determined in laboratory? | **07** |

**OR**

| | | | |
|---|---|---|---|
| **Q.5** | **(a)** | What are the different types of soil stratum can occur in nature? Describe in brief. | **07** |
| | **(b)** | The mass specific gravity of soil equals 1.62. The specific gravity of soil is 2.65. Determine void ratio under assumption that the soil perfectly dry. What would be the void ratio if the sample is assumed to have water content 9%? | **07** |

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