

**GUJARAT UNIVERSITY**  
**B.E. Sem VII (Civil) Examination**  
**Geotechniques (EP-I)**

Saturday, 5th January, 2008]

[Time : 3 Hours

Max. Marks : 100

- Instructions :** (1) Answer to the two sections must be written in separate answer books.  
 (2) Figures to the right indicate full marks.  
 (3) Assume suitable additional data if necessary.  
 (4) Use of non programmable computer is permitted.

**SECTION I**

- Q.1 (a)** Answer the following. ( Any Two) 16
- 1 What are the basic modes of failure of earth slope? Briefly outline the remedial measures to prevent failure of slopes.
  - 2 List the different types of land slides and state the causes for a slide to occur.
  - 3 Comment on the following statements:
    - (i) The friction circle method is not applicable to cohesive soil
    - (ii) The Taylor's stability no. is applicable to cohesion less soil.
- (b)** A soil has a compression index of 0.28. At a stress of  $120 \text{ kN/m}^2$  the void ratio was 1.02. Calculate the void ratio if the stress on the soil is increased to  $180 \text{ kN/m}^2$  and total settlement of the 6m thick stratum.
- Q.2 (a)** Determine the factor of safety against sliding for the slip surface shown in fig.(I) Use Swedish circle method. Soil properties are  $C = 15 \text{ kN/m}^2$ ,  $\phi = 30^\circ$ ,  $\gamma = 18 \text{ kN/m}^3$  16

**OR**

- (a)** A 12m deep cut with 1:1 slope is made in a layered clay deposit with the following details.

Depth (m)	Soil type	Cohesion (kN/m <sup>2</sup> )
0 - 5	very soft clay	10
5 - 8	medium stiff clay	50
8 - 15	stiff clay	100
15	rock	--

Compute the factor of safety against sliding corresponding to rotation center shown in fig (ii).  $\gamma = 18 \text{ kN/m}^3$

- (b)** A bed of compressible clay of 4m thickness has pervious sand on the top and impervious rock at bottom. In a consolidation test on the specimen from this deposit, 90% settlement was reached in 4 hours. The specimen was 20mm thick. Estimate the time in years for the building founded over this deposit to reach 90% of its final settlement.

**OR**

- (b)** A homogeneous clay layer 9m thick is expected to have an ultimate

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settlement of 300mm. After two years the average settlement was measured 100mm. How much longer will it take for average settlement 200mm?

**Q.3** Answer the following. (Any three)

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- (a) Explain the assumptions made in the Terzaghi's one dimensional consolidation theory and derive the equation
- (b) Explain the terms: (i) time factor (ii) compression index.
- (c) What is pre consolidation ratio? How the pre consolidation pressure is measured?
- (d) Describe the log-time fitting method for determining co-efficient of consolidation.
- (e) Explain the function of sand drain and precautions to be taken while designing it.

**SECTION - II**

**Q.4 (a)** Answer the following. ( Any Two ) :

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- 1 Explain the effect of pore pressure on shear strength of soil
- 2 Discuss the factors affecting shear strength of cohesive soil.
- 3 Define critical void ratio? On which factor it depends?

(b) A 3m high embankment of soil has total stress parameters as  $C = 50 \text{ kN/m}^2$ ,  $\phi = 30^\circ$ ,  $\gamma = 18 \text{ kN/m}^3$ . The Skempton's pore pressure parameters are  $A = 0.45$  and  $B = 0.85$ . If the height of embankment is raised from 4m to 7m, estimate the shear strength of soil at the base of embankment just after increasing the height. The lateral pressure is one third of vertical pressure.

**Q.5 (a)** Discuss the range of pore pressure parameter B in different soil condition.

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(b) Mention any three hydraulic and strength properties of geo textile material

**OR**

(b) Compare Boussinesq and Westergaard stress distribution theory

(c) Two footing of size 4m x 4m and 3m x 3m are placed 6m apart at same level and carry concentrated load of 1000kN and 1250kN respectively. Compute the vertical stress at following points.

- (i) Mid way between footings at 4m depth
- (ii) Vertically below centers of the footings at 5m depth.

**OR**

(c) An over head water tank is supported at a depth of 3m by four isolated square footings of 2m side each placed in square pattern with center to center spacing of 8m. Compute the vertical stress at foundation level at (i) center of four footing (ii) center of four footing.

**Q.6** Answer the following. ( Any three)

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- (a) Explain the concept of reinforced earth mass using Mohr-Coulomb principle.
- (b) Explain in detail tri axial compression test with its merits and de merits
- (c) Discuss thoroughly Lambe stress path for any three field loading conditions.
- (d) Mention major five functions of geo textile material. Discuss any two in detail.
- (e) Compare the vertical stress with depth below the center of circular, square and strip load.
- (f) An embankment has a total height of 6m, slope 1:2 and total top width of 4m. Determine the vertical stress at a point P which is below the ground surface and is on the center line of embankment.  $\gamma = 20 \text{ kN/m}^3$



