

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE - SEMESTER-VI • EXAMINATION – WINTER 2013**

**Subject Code: 160606****Date: 09-12-2013****Subject Name: Geotechnical Engineering II****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.
4. Draw neat sketch wherever necessary.

- Q.1** (i) Write the basic principles involved in the geophysical methods of subsurface soil exploration **03**  
 (a) (ii) A cutting is to be made in clay for which the cohesion is  $35 \text{ kN/m}^2$  and  $\phi = 0^\circ$ ,  $\gamma = 20 \text{ kN/m}^3$ . Find maximum depth for a cutting of side slope 1.5 to 1.0. if the factor of safety is 1.5. The stability number for 1.5 to 1.0 slope and  $\phi = 0^\circ$  is 0.17. **04**
- (b) (i) A standard penetration test is conducted at a depth of 5 m in a saturated fine sand. If the observed N value is 25, then the equivalent restraint value is \_\_\_\_\_. **03**  
 (ii) Comment on the following statements (Any Two). **04**
- (i) Taylor's Stability Number is applicable to cohesion less soil only.
  - (ii) If the angle of slope is greater than angle of friction, slope is always stable.
  - (iii) Settlement of a pile group is more than the settlement of an individual pile.
- Q.2** (a) Determine the net allowable load and gross allowable load for a square footing of  $2 \text{ m} \times 2 \text{ m}$  size with a depth of foundation of 1.0 m. Assume local shear failure. Use Terzaghi's theory. Soil properties are:  $\gamma = 18 \text{ kN/m}^3$ ,  $c' = 15 \text{ kN/m}^2$ , For  $\phi' = 25^\circ$   $N_{c'} = 14.8$ ,  $N_{q'} = 5.6$ ,  $N_{\gamma'} = 3.2$ ,  $F.S = 3.0$ . **07**  
 (b) Write the assumptions made in the Terzaghi's bearing capacity theory. Also draw its different failure zones. **07**
- OR**
- (b) Define contact pressure. Which factors affect contact pressure distribution? Draw contact pressure diagram for rigid footing on clay and sand. **07**
- Q.3** (a) Write major points of difference between the following. **08**
- (i) Active earth pressure and passive earth pressure.
  - (ii) Standard penetration test and plate load test.
- (b) Explain the Rankine's theory for active earth pressure in cohesive soil. **06**
- OR**
- Q.3** (a) Differentiate between the following. **08**
- (i) Strip footing and strap footing.
  - (ii) Skin resistance and tip resistance.
- (b) Explain the methods to reduce foundation settlement **06**
- Q.4** (a) A smooth backed vertical wall is 6.3 m high and retains a soil with a bulk unit weight of  $18 \text{ kN/m}^3$  and  $\phi = 18^\circ$ . The top of the soil is level with the top of the wall and is horizontal. If the soil surface carries a uniformly distributed load of  $4.5 \text{ kN/m}$ , determine the total active thrust on the wall per meter length of the wall and its point of application. **07**  
 (b) Discuss various dynamic formula for load carrying capacity of pile with their limitations. **07**
- OR**
- Q.4** (a) Classify the piles according to their function. **07**

- (b) A 4 m high vertical cut retains the cohesive soil backfill. The soil properties are :  $\gamma = 18 \text{ kN/m}^3$   $\phi' = 12^\circ$   $c' = 20 \text{ kN/m}^2$  Determine the stress intensity at top and bottom of the cut ,depth of tension crack and maximum depth of unsupported excavation. **07**
- Q.5** (a) Design a square pile group to carry 400 kN load in clay with an unconfined compressive strength of  $60 \text{ kN/m}^2$ . The piles are 30 cm diameter and 6 m long. Adhesion factor  $\alpha = 0.6$ , F.S. =3. **07**
- (b) Derive the expression for the factor of safety of an infinite slope in a dry cohesion less soil. **07**
- OR**
- Q.5** (a) Illustrate the procedure for plotting an isobar of intensity 0.1 Q. Also draw Isobar diagram. **07**
- (b) What are the basic modes of failure of earth slopes? What are the remedial measures to prevent failure of earth slopes? **07**

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