

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE – SEMESTER-VI • EXAMINATION – SUMMER- 2015****Subject Code: 160606****Date: 18/05/2015****Subject Name: Geotechnical Engineering II****Time: 10.30am-01.00pm****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) Define Under Reamed pile. Discuss its method of construction with help of a neat sketch and give criteria for bulb design. **07**
- (b) In a 25 pile group the pile diameter is 40cm and centre to centre spacing is 1.5m. If  $c = 50 \text{ kN/m}^2$ , determine whether the failure would occur with pile acting singularly or as a group. Neglect tip bearing. All piles are 15m long. Take  $m = 0.7$  for shear mobilization around each pile. **07**

- Q.2** (a) Explain concept of slope stability for infinite slope of ground? Derive its relation for purely cohesive soils **07**
- (b) Discuss with help of a neat sketch method of slices for slope stability of  $c - \phi$  soils **07**

**OR**

- (b) Determine the maximum permissible angle for a slope in sandy soil with angle of internal friction ( $\phi$ ) =  $36^\circ$  and cohesion ( $c$ ) = 0 and bulk density ( $\gamma$ ) =  $20 \text{ kN/m}^3$  if (a) sand is dry (b) when waterlogged with steady seepage parallel to the surface. Assume factor of safety = 2 **07**
- Q.3** (a) Calculate the total active thrust or pressure per metre length of an 8m high smooth vertical retaining wall. The properties of backfill soil are  $c = 20 \text{ kPa}$ ,  $\phi = 25^\circ$  and  $\gamma = 17.5 \text{ kN/m}^3$ . **07**
- (b) Discuss in detail Rehmann's graphical method for determination of earth pressure. **07**

**OR**

- Q.3** (a) Differentiate between Rankine's and Coulomb's active earth pressure theories. **07**
- (b) A retaining wall 6m high supports two layers of soil each of depth 3m. The wall carries a surface load of 50kPa and has water table 1.5m from the ground level. Determine the total lateral thrust on the wall and the point of application above the base of the wall. **07**

Properties	Cohesion (c)	Angle of Internal Friction ( $\phi$ )	Density ( $\gamma$ )
Upper layer	0	30	$17.5 \text{ kN/m}^3$
Lower layer	10	18	$19.0 \text{ kN/m}^3$

- Q.4** (a) What is subsurface exploration? Explain the objectives and any one method of subsurface exploration? **07**
- (b) Find the intensity of vertical pressure and horizontal stress at a point 5m below a 30kN point load at Ground Level. What will be vertical pressure and horizontal stress at a point 2m horizontally away and at a depth of 4m from axis of loading? **07**

**OR**

- Q.4** (a) Explain the term “Stress Distribution” with respect to soil. Derive the relation for vertical stress at any point due to a given point load using Boussinesq’s theory. **07**
- (b) Discuss the factors affecting selection of type of foundation? Give in brief the steps to be followed for foundation selection. **07**
- Q.5** (a) Explain the method for determination of bearing capacity using IS code specifications. Discuss the term “Permissible Settlement” **07**
- (b) Explain SPT test alongwith the various corrections to be applied to it? **07**

**OR**

- Q.5** (a) Discuss the changes to be carried out for bearing capacity calculation with respect to rise in water table upto the ground level. **07**
- (b) A rectangular footing has a size of 1.8 X 3 m to transfer a column load to a depth of 1.5m. Calculate the safe load which the footing can carry at a factor of safety of 3 against shear failure. Use IS code method. The soil has  $n = 40\%$ ,  $G = 2.67$ ,  $w = 15\%$ ,  $c = 8\text{kN/m}^2$ ,  $\phi = 32.5^\circ$ . Take  $N_c = 38.13$ ,  $N_q = 25.85$  and  $N_\gamma = 35.21$  **07**

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