

8E4031

Roll No. _____

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B. Tech. VIII Sem. (Main/Back) Exam., April, 2015

Civil Engineering

8CE1 Geotechnical Engineering - II

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal marks**. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

*Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)*

1. Graph Paper Centimeter

2. NIL

UNIT – I

Q.1 (a) Derive an expression for determination of vertical stress under a uniformly loaded circular area. [8]

(b) The uniform intensity of loading at the foundation level of a building, 20 m in width and very great extent in length is estimated to be 10 t/m^2 . A 5 m thick clay layer exists at a depth of 10m below the foundation. Find the average increase in vertical pressure at the clay layer under the centre line and edge of the building. [8]

OR

Q.1 (a) What is the basis of construction of Newmark's influence chart? How is it used? [8]

- (b) A 2000 kg point load acts on the surface of an elastic medium of very great extent. What are the intensities of vertical pressure due to the load at 5, 25 and 50m directly below the load? Find the vertical pressures also at points 5m and 25m deep but 10m horizontally away from the vertical axis of the load. [8]

UNIT – II

- Q.2 (a) Explain logarithm of time method for determination of coefficient of consolidation. [6]
- (b) Subsoil strata at a site consist of a stratum of silty sand 6m thick overlying a stratum of coarse sand of same thickness. Under the coarse sand stratum lies a deposit of clay 14m thick with rock at bottom. Water table that is originally at 2m depth is lowered by drainage to a depth of 6m. For silty sand, $G = 2.64$, $e = 0.72$, for coarse sand, $G = 2.68$, $e = 0.68$, for clay $G = 2.72$, $e = 0.92$, compression index (C_c) = 0.38. Water content of soil above water table is 25%. Calculate consolidation settlement of clay layer due to lowering of water table. [10]

OR

- Q.2 (a) Give a few causes of pre – consolidation of soils. [4]
- (b) List and discuss assumptions in Terzaghi's theory of one – dimensional consolidation. Derive the basic differential equation of consolidation. Also give Terzaghi's graphical solution for the differential equation for a set of boundary conditions. [12]

UNIT – III

- Q.3 (a) What are various causes of failure of slopes? [4]
- (b) Describe friction circle method of analyzing stability of finite slopes. Also discuss the modifications in the method during sudden drawdown. [12]

OR

- Q.3 (a) How would you decide the depth and lateral extent of exploration? Give two empirical guidelines that enable the determination of depth of exploration. [4]
- (b) Explain with a neat sketch the stationary piston sampler for recovering samples from subsurface. [4]
- (c) What are various types of samples that could be recovered from subsoil? Explain various factors causing disturbance of sample. [8]

UNIT – IV

- Q.4 (a) A retaining wall with a smooth vertical back has to retain a backfill of $c - \phi$ soil up to 5m above ground surface. The surface of backfill is horizontal and it has following properties: [12]

$$\phi = 12^\circ, c = 1.5 \text{ t/m}^2, \gamma = 1.8 \text{ t/m}^3$$

- (i) Plot the distribution of active earth pressure on the wall.
- (ii) Determine the magnitude and point of application of active thrust.
- (iii) Determine the depth of the zone of tension cracks.
- (iv) Determine the intensity of a fictitious uniform surcharge, which, if placed over the backfill can prevent the formation of tension cracks.
- (b) Draw Mohr circles for Rankine's active and passive states of plastic equilibrium showing directions of failure planes. [4]

OR

- Q.4 (a) Define earth pressure. What do you understand by active, at rest and passive earth pressure? Give examples. [6]

- (b) A retaining wall retains dry sand to a depth of 8m. The backfill soil has the following properties: $c = 0$, $\phi = 32^\circ$, $\gamma = 17.5 \text{ kN/m}^3$. The angle of wall friction (δ) = 10° . The back of retaining wall is inclined at a positive batter angle of 15° . If the surface of the backfill slopes upwards at a surcharge angle of 15° , calculate the total active thrust per unit length of the wall and its line of action using Rebhann's graphical construction. [10]

UNIT – V

- Q.5 (a) How would you interpret for net loading intensity for a given permissible settlement in case of sands from the results of plate load test? [4]
- (b) What is the effect of rise of water table on bearing capacity of footings resting on sands and clays? [4]
- (c) A square footing $1.2\text{m} \times 1.2\text{m}$, rests at a depth of 1m in a saturated clay layer 4m deep. The clay is normally consolidated having an unconfined compressive strength of 40 kN/m^2 . The soil has the following properties.
Liquid limit = 30%, water content = 28%, $\gamma_{\text{sat}} = 17.8 \text{ kN/m}^3$, $G = 2.68$. Using Terzaghi's equation, determine net safe bearing capacity. Compute the settlement that would result if this load intensity were allowed to act on the footing. Natural water tables is quite close to the ground surface. [8]

OR

- Q.5 (a) How would you estimate allowable bearing pressure of a footing resting on sand using SPT – value as per IS code? [6]
- (b) What are relative advantages and disadvantages of well foundations over the pile foundations? [6]
- (c) What are the criteria for satisfactory action of machine foundations? [4]