Student Exam No:

GANPAT UNIVERSITY
B.TECH SEM V CIVIL ENGINEERING
REGULAR EXAMINATION DEC- 2012
2CI503 GEOTECHNICAL ENGINEERING - I

Time: 3 Hours **Max Marks: 70**

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 data if required.

SECTION - I

Q1(A) Explain laboratory consolidation test in details with figure. (6)

(B) Derive an expression for the vertical stress at a point due to a point load using Boussinesq's theory (6)

OR

Q1(A) Derive the expressions for active earth pressures for both cohesive and cohesionless soil conditions. (6)

(B) Write short note on Methods for determination of coefficient of consolidation. (6)

Q2(A) Derive an equation for factor of safety of an infinite slope in cohesion less soil for dry and submerged soil conditions. (6)

(B) Define (a) Co-efficient of permeability (b) Discharge velocity (c) Seepage velocity. Derive a relationship between discharge velocity and seepage velocity. (5)

OR

Q2(A) Explain the stress & void ratio relation with curve in details. (6)

(B) Explain the equivalent point load method. (5)

Q3(A) A water tank is supported by a ring foundation having outer diameter of 10m and inner diameter of 7.5m. The ring foundation transmits uniform load intensity of 160kN/m^2. Compute the vertical stress induced at a depth of 4m, below the centre of ring foundation, using (a) Boussinesq's analysis and (b) Westergaard's analysis, taking $\mu = 0$. (6)

(B) A two meter thick saturated clay layer is sandwiched between two (6)

highly pervious layers of course sand. When a building is constructed on the ground surface, it starts settling due to the consolidation of the clay layer. If the average coefficient of consolidation is 4.5×10^{-4} cm^2/sec. in how many days will the building reach half of its final consolidation?

SECTION – II

Q4(A) Enlist various methods for the determination of water content in laboratory and explain any one of them. (4)

(B) Define the following terms:(a) Bulk mass density (b) Dry mass density (c) Saturated mass density (d) Mass density of soil (4)

(C) A fully saturated clay sample has a mass of 130 gm and has a volume of 64 cm^3. The sample mass is 105 gm after oven drying. Assuming that the volume does not change during drying, determine the following:(i) specific gravity of soil solids (ii) Void ratio (iii) porosity (iv) dry density. (4)

OR

Q4(A) Enlist various methods for determination of field density. Discuss any one. (4)

(B) State Stock's low. What is its use in sedimentation analysis? What is its limitation? (4)

(C) In order to find the relative density of sand a mould of volume 1000 ml was used. When the sand was dynamically compacted in the mould, its mass was 2.10 kg, whereas when the sand was poured in loosely, its mass was 1.635 kg. If the in-situ density of the soil was 1.50 mg/m^3, calculate the relative density. Take G=2.70. Assume that the sand is saturated. (4)

Q5(A) Compare the AASHTO classification system and Unified soil classification system. (3)

(B) An earthen embankment of 150 m^3 volume is to be constructed with a soil having a void ratio of 0.80 after compaction. There are three borrow pits marked A, B, C, having soil with void ratio of 0.90, 1.50 and 1.80, respectively. The cost of excavation and transporting the soil is Rs 0.28, Rs 0.25 and Rs.0.20 per m^3 Respectively. Calculate the volume of soil to be excavated from each pit. Which borrow pit is the most economical? Take G=2.66 (4)

(C) A cylindrical specimen of a cohesive soil of 10 cm diameter and 20 cm length was prepared by compaction in a mould. If the wet mass (4)

of the specimen was 3.25 kg and its water content 15%, determine the dry density and the void ratio. If the specific gravity of the particles was 2.70, find the degree of saturation.

OR

Q5(A) Write a short note on (a) Placement water content (b)Relative Compaction (4)

(B) State the various corrections required for hydrometer reading. How these corrections are determined. (4)

(C) Discuss various shrinkage parameters. (3)

Q6(A) Undrained triaxial tests are carried out on four identical specimens of silty clay, and the following results are obtained. (6)

Sample no	Cell pressure (kN/m^2)	Deviator stress (kN/m^2)	Pore water pressure (KN/m^2)
1	50	350	5
2	100	440	10
3	150	530	12
4	200	610	18

Determine the value of the effective angles of shearing resistance and the cohesion intercept by plotting (a) conventional failure envelope from Mohr circles, (b) Modified failure envelope.

(B) Describe the triaxial test. What are the advantages of triaxial shear test over the direct shear test? (4)

(C) What is Mohr's strength theory for soil? Sketch the typical envelop for clean sand. (2)

END OF PAPER