Student Exam No:

GANPAT UNIVERSITY
B.TECH SEM V CIVIL ENGINEERING
REGULAR EXAMINATION NOV - 2015
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) Enlist the various methods for determining water content in the laboratory. Explain calcium carbide method. **(4)**

(B) A cylindrical specimen of soil is 7.5 cm long and 3.75 cm in diameter and has a mass of 175 gm. If the water content is 18 % and the specific gravity of solids is 2.68, determine the degree of saturation. **(4)**

(C) What is compaction curve? Give its salient features. What is zero-air void line? **(4)**

OR

Q1(A) In a compaction test on a soil, the mass of wet soil when compacted in the mould was 1.855 kg. The water content of the soil was 16%. If the volume of mould was 0.945 litres, determine the dry density, void ratio, degree of saturation and percentage air voids. Take G=2.68. **(4)**

(B) What are the factors that affect compaction? Discuss in brief. **(4)**

(C) A soil sample with a grain specific gravity of 2.67 was filled in a 1000 ml container in the loosest possible state and the dry weight of the sample was found to be 14.75 N. It was then filled at the densest state obtainable and the weight was found to be 17.70 N. The void ratio of the soil in the natural state was 0.63. Determine the density index in the natural state. **(4)**

Q2(A) The following are the results of the standard compaction test performed on a sample of soil. (6)

Water content (%)	7.7	11.5	14.6	17.5	19.7	21.2
Mass of wet soil(kg)	1.7	1.89	2.03	1.99	1.96	1.92

If the volume of the mould used was 950 cc. and the specific gravity of soil grain was 2.65, make necessary calculations and plot the water content-dry density curve and obtain the optimum water content and the maximum dry density.

(B) Enlist the different methods for determining liquid limit in a laboratory. Describe cone penetration method in detail. (5)

OR

Q2(A) Explain the test of compaction in which higher compactive effort is to be given to the soil. (6)

(B) Derive the relation between Bulk unit weight (γ_b), Unit weight of water (γ_w), specific gravity of soil solid (G), Water content (w) and void ratio (e). (5)

Q3(A) Describe direct shear test. What are its merit and demerits? (6)

(B) A series of consolidated untrained triaxial test was conducted on oven-consolidated clay and the following results were obtained. (6)

Sample no	Cell pressure(kN/m^2)	Deviator stress(kN/m^2)	Pore water pressure(kN/m^2)
1	125	510	-70
2	250	620	-10
3	500	850	+120

Plot the strength envelope in term of effective stresses and hence determine the strength parameters.

If the soil was preconsolidated to a pressure of 1000 kN/m^2, plot the variation of the pore pressure A_f with the over consolidation ratio.

SECTION - II

Q4(A) Explain variable head permeability test with neat sketch. (4)

(B) Write a short note on vertical stress distribution on a horizontal plane. (4)

(C) Explain the stress v/s void ratio curve in details with neat figure. (4)

OR

Q4(A) Define the terms discharge velocity and seepage velocity. Also derive the relationship between them. (4)

(B) Write a short note on square root of time fitting method. (4)

(C) Explain the equivalent point load method. (4)

Q5(A) Write down the assumptions for Rankine's theory. Derive an expression for active earth pressure under the dry cohesive soil conditions. (6)

(B) Discuss the various methods for improving stability of slopes. (5)

OR

Q5(A) Derive an equation for factor of safety of an infinite slope in cohesionless soil under the effect of steady seepage parallel to the slope. (6)

(B) Derive an equation for determining the magnitude of earth pressure at rest backfill. (5)

Q6(A) Calculate the coefficient of permeability of a soil sample 6 cm in height and 50cm^2 in cross – sectional area, if a quantity of water equal to 450ml passed down in 10 minutes under an effective constant head of 40 cm. On oven drying, the test sample weighs 495 gms. Taking the specific gravity of soil solids as 2.65, calculate the seepage velocity of water during the test. (4)

(B) A concentrated load of 50kN acts on the surface of soil. Plot the variation of vertical stress increment due to load on the horizontal plane at a depth of 2m up to a horizontal distance of 3m on either side of centre. (4)

(C) A saturated clay layer of 5m thickness takes 1.5 years for 50% primary consolidation when drained on both sides. Its coefficient of volume change is 1.5×10^{-3} m^2/kN. Determine the co- efficient of consolidation and coefficient of permeability. Assume $\gamma_w = 10kN/m^3$. (4)

END OF PAPER