Exam No: _____

GANPAT UNIVERSITY

B. TECH – V CIVIL ENGINEERING REGULAR EXAMINATION– NOV-DEC 2016

2CI503- GEOTECHNICAL ENGINEERING - I

TIME: 3 HRS **TOTAL MARKS:60**

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.
(2) Figures on right indicate full marks.
(3) Be precise and to the point in answering the descriptive questions.
(4) Assume suitable data if necessary.

SECTION: I

Q.1 **(A)** Explain briefly Constant head permeability test with neat sketch. **(3)**

(B) A stratified soil deposits of four layers of equal thickness. The coefficient of permeability of the second, third and fourth layers are respectively $1/3^{rd}$, $1/2^{nd}$ and twice of the coefficient of permeability of the top layer. Compute the average permeability of the deposit, parallel and perpendicular to the direction of stratification in terms of the permeability of the top layer. **(3)**

(C) Derive an expression for vertical stresses under a circular area with neat sketch. **(4)**

OR

Q.1 **(A)** Derive an expression for vertical stress at any point under a rectangular area with neat sketch. **(3)**

(B) Explain briefly theory of spring analogy for primary consolidation with neat sketch. **(3)**

(C) A rectangle with area of 2 m × 4 m carries a uniform load of 80 kN/m^2 at the ground surface. Find the vertical pressures at 5 m below the center and corner of the loaded area using equivalent point load method. **(4)**

Q.2 **(A)** Derive an expression for Earth pressure at rest condition. **(3)**

(B) Give difference between Consolidation and Compaction. **(3)**

(C) Derive the expression for Rankine's active earth pressure theory for cohesive soil with its assumption. **(4)**

OR

Q.2 **(A)** Explain terms (i) Coefficient of compressibility (ii) Compression Index and (iii) Expansion Index **(3)**

(B) Derive an equation for stability of an Infinite slope for cohesionless soil in dry condition. **(3)**

(C) Explain briefly different types of slope failure. **(4)**

Q.3 (A) Calculate the value of permeability of a sample of 5 cm height and 50 cm^2 cross sectional area, if a quantity of water of 400 cm^3 flows down in 10 min under an effective constant head of 40 cm. On oven drying the test specimen weighed 500 gm. Assume G = 2.65, Calculate the discharge velocity and seepage velocity of water. (5)

(B) Determine the intensities of active and passive earth pressure at depth of 7m in dry cohesionless sand with an angle of internal friction of 30° and unit weight of 18 kN/m^3. What will be the intensities of active and passive earth pressure if the water level rises to the ground level? Take saturated unit weight of sand as 22 kN/m^3. (5)

SECTION: II

Q.4 (A) Derive Relation between (1) e, G, w and S. and (2). Porosity and void ratio. (5)

(B) The natural bulk unit weight of a sandy stratum is 18.54 kN/m^3 and it has a water content of 8%. For determining the density index, dried sand from the stratum was first filled loosely in a 300cm^3 mould and then vibrated to give a maximum density. The loose dry mass in the mould was 480 gm and the dense dry mass at the maximum compaction was 570 gm. If the specific gravity of solid is 2.66 find the density index of the sand in the stratum. (5)

OR

Q.4 (A) Derive the relation between (1) γ_d, G, w and S (2) Void ratio and porosity (5)

(B) 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. (5)

Q.5 (A) The following are the results of the standard compaction test perform on a sample of soil. (5)

Water content (%)	0.12	0.14	0.16	0.18	0.20	0.22
Mass of wet soil(kg)	1.68	1.85	1.91	1.87	1.87	1.85

If the volume of the mould used was 950 ml. and the specific gravity of soil grain was 2.70, make necessary calculation and plot the water content-dry density curve and obtain the optimum water content and the maximum dry density. Also calculate void ratio, degree of saturation and the theoretical maximum dry density.

(B) Write a short note on static cone penetrometer method to determine liquid limit in the laboratory. (5)

OR

Q.5 **(A)** An embankment having total volume of 1500 m^3 is to be constructed having a bulk density of 1.98 g/cm^3 and a placement water content of 18%. The soil is to be obtained either from borrow area A or borrow area B which have void ratio of 0.70 and 0.60 respectively and water content of 16% and 12% respectively. Taking G =2.66 for both the soil. Determine the volume of soil required to be excavated from each of the areas. If the cost of excavation is Rs. 50 / m^3 in each area but cost of transportation is Rs. 30 and 40 per m^3 from areas A and B respectively, which of the borrow area is more economical? **(5)**

(B) Define the following terms: (1) Liquid limit (2) Plastic limit (3) Shrinkage limit (4) Plasticity index (5) Liquidity index **(5)**

Q.6 **(A)** Describe Triaxial test in details. **(5)**

(B) The results of a sieve analysis of a soil are given below. **(5)**

IS Sieve	20 mm	10 mm	4.75 mm	2 mm	1 mm	0.6 mm	0.425 mm	0.212 mm	0.150 mm	0.075 mm	Pan
Mass of soil retained in gm	35	40	80	150	150	140	115	55	35	25	75

Total mass of sample is 900 gm. Draw the particle size distribution curve and hence uniformity co efficient and co efficient of curvature. Comment on the results obtained.

----------END OF PAPER----------