Code No: **R32011** **R10** **Set No. 1**

III B.Tech II Semester Regular/Supplementary Examinations, April - 2017
GEOTECHNICAL ENGINEERING –I
(Civil Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
Note: Ordinary graph sheet is required.
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1 a) Draw three phase soil system and establish the relationship: [7M]
$\gamma' = \frac{(G-1)\gamma_w}{1+e}$ where, γ' = submerged unit of soil,G = Sp.gr. of solids, γ_w = unit weight of water, e = void ratio.

b) A soil has a volume of 1000 cm^3 and weight of 17.5 N, the specific gravity of solids is 2.67. If the dry unit weight of soil is 14.8 kN/m^3, determine (i) water content, (ii) void ratio, (iii) porosity, (iv) degree of saturation, (v) saturated unit weight, (vi) submerged unit weight. [8M]

2 a) Briefly explain how you determine diameter and cumulative percent finer from Hydrometer analysis. [7M]

b) A saturated sample has a volume of 20 cm^3 at its liquid limit. Given Liquid limit, w_l = 42%, shrinkage limit, w_s = 17%, G = 2.74. Find the minimum volume which the soil can attain? [8M]

3 a) Explain the following factors that affect the permeability of soil : [7M]
(i) Void ratio (ii) Properties of pore fluid.(iii)adsorbed water

b) Determine the average coefficient of permeability in the horizontal and vertical directions for a deposit consisting of three layers of thickness 4m,2m and 3m and having coefficient of permeability of $3x\ 10^{-3}$ cm/sec , $3x\ 10^{-5}$ cm/sec and $4x\ 10^{-2}$ cm/sec respectively. Assume the layers are isotropic. [8M]

4 a) Define 'Quick sand' and derive the formula for critical hydraulic gradient. [7M]

b) A deposit of cohesionless soil with a permeability of 3×10^{-2} cm/s has a depth of 10 m with an impervious ledge below. A sheet pile wall is driven into this deposit to a depth of 7.5 m. The wall extends above the surface of the soil and a 2.5 m depth of water acts on one side. Sketch the flow net and determine the seepage quantity per metre length of the wall. [8M]

5 a) Derive the formula for vertical stress increase due to circular loaded area. [7M]

b) The base of a tower consists of a equilateral triangular frame on the corners of which three legs of the tower is supported. The total weight of the tower is 600 kN, which is equally carried by all the three legs. Compute the increase in vertical stress in the soil caused at a point 5m below one of the legs. Use Boussinesq's theory. [8M]

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6 a) Explain briefly suitability of compaction equipment for different types of soils in the field. [7M]

b) A soil having specific gravity of grains is 2.85, is subjected to IS compaction test in mould volume of 1x 10^{-3} m^3. The observations are recorded as follows: [8M]

Wt. of wet sample (N)	16.50	17.25	17.35	17.90	17.75
Water content (%)	19.1	20.5	21.3	22.5	24.0

Plot the water content – dry unit weight curve and obtain MDD & OMC. Draw zero air voids line also.

7 a) Define and explain the terms, coefficient of compressibility, coefficient of volume change, compression index and degree of consolidation. [8M]

b) A clay layer of soft clay 8 m thick is located between two layers of sand. Consolidation test on representative sample of clay gave C_v = 3 x 10^{-4} cm^2/sec. The expected ultimate settlement of a foundation on the clay layer is 5 cm. How much time is required for 30% of ultimate settlement to occur? [7M]

8 a) Briefly explain the following: [7M]
(i) critical void ratio and (ii) liquefaction of sands

b) In an unconfined compression test, a sample of sandy clay 8 cm long and 4 cm in diameter fails under a load of 120 N at 10% strain. Compute the shearing resistance taking into account the effect of change in cross-section of the sample. [8M]

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