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BTECH
(SEM V) THEORY EXAMINATION 2018-19
GEOTECHNICAL ENGINEERING

Time: 3 Hours *Total Marks:100*

Notes: *Assume any Missing Data.*

SECTION A

Q1. Attempt any FOUR parts **5x4=20**

a) Define the following terms: liquid limit; plastic limit; shrinkage limit and plasticity index.

b) An oven-dry soil sample of volume 225cm^3 weighs 3.90N.if the grain specific gravity is 2.72,determine the Void-ratio and shrinkage limit. What will be the water content which will fully saturate the sample and also cause an increase in volume equal to 8% of the original dry volume?

c) Write short note on consistency of clayey soils.

d) Describe in detail the Indian system of soil classification. When would you use dual symbols for soils?

e) Derive the relationship between dry density and bulk density in terms of water content.

f) A saturated soil sample has a volume of 23cm ^{3} at liquid limit. The shrinkage limit and liquid limit are 185 and 45% respectively. The specific gravity of soil is 2.73.determine the minimum volume which can be attained by the soil.

SECTION B

Q2. Attempt any TWO parts **10x2=20**

a) Distinguish between superficial velocity and seepage velocity. Describe briefly how they are determined for sand and clay in the laboratory.

b) A saturated sand layer over a clay stratum is 5m in depth. The water is 1.5m below ground level. If the bulk density of saturated sand is 17.66kN/m^3.calculate the effective and neutral pressure on the top of the claylayer.

c) A uniform soil deposit has a void ratio 0.6 and specific gravity of 2.65.the natural ground water is at 2.5m below natural ground level. Due to capillary moisture, the average degree of saturation above ground water table is 50%.determine the neutral pressure, total pressure and effective pressure at a depth of 6m.draw a neat sketch.

Q3. Attempt any TWO parts **10x2=20**

a) A concentrated load of 200kN act at foundation level at a depth of 2m below ground surface. Find the vertical stress along the axis of the load at a depth of 10m and at a radial distance of 16.4 ft at the same depth by(a) boussinesq and (b) westergaard formulae for μ=0.neglect the depth of the foundation.

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b) What is coulomb's wedge theory of earth pressure? Explain the conditions for obtaining the maximum active earth pressure.

c) A retaining wall with a vertical back of height 7.32m supports a cohesionless soil of unit weight 17.3kN/m^3 and an angle of shearing resistance Φ=30°.the of the soil is horizontal. Determine the magnitude and direction of the active thrust per meter of wall using Rankine's theory.

SECTION C

Q4. Attempt any TWO parts **10x2=20**

a) Derive the relationship between principal stresses and cohesion C.

b) When an undrained triaxial compression test was conducted on specimens of clayey silt, the following results were obtained:

Specimen no	**1**	**2**	**3**
σ_3 (kN/m^2)	17	44	56
σ_1 (kN/m^2)	157	204	225
u(kN/m^2)	12	20	22

Determine the values of shear parameters considering (a) total stresses and (b) effective stresses.

c) Derive the equation giving major principal stress in terms of minor principal stress and shear strength parameters of soil.

Q5. Attempt any TWO parts **10x2=20**

a) The total column load of a footing near ground level is 5000kN.the subsoil is cohesionless soil with Φ =38° and γ = 19.5kN/m^3.the footing is to be located at a depth of 1.50m below ground level. For a footing of size 3x3m.determine the factors of safety by Terzaghi's general shear failure theory if the water table is at a depth of 0.5m below the base level of the foundation.

b) A foundation of size 12x8m is founded at a depth of 2m below ground level in cohesionless soil with water table at ground level. The average SPT (N) value below the footing is 16.determine the net safe bearing pressure under settlement consideration.

c) A net load of 425kN per metre length is carried an a strip footing 2m wide at a depth of 1m in a stiff clay of saturated unit weight 21kN/m^3,the water table being at a depth of 3m from ground level. Determine the factor of safety with respect to general shear failure (a) when C_u=105kN/m^2 and Φ_u=0,(b) when c' =10kN/m^2 and Φ=25°.

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