Sub Code: RCE501

Paper Id: 100516 Roll No: | | | | | | | | | | | | | |

B TECH

(SEM V) THEORY EXAMINATION 2019-20

GEOTECHNICAL ENGINEERING

Time: 3 Hours ***Total Marks: 70***

Notes:

- *Attempt all Sections.*
- *Assume any missing data.*

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a.	Explain index properties of soil.
b.	What are the basic structural units of clay minerals?
c.	List the factors affecting permeability of soils.
d.	Define critical gradient.
e.	Differentiate between compression index and expansion index
f.	What are different types of slope failure?
g.	Describe various types of pile foundation.

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

a.	Prove that dry unit weight of soil $\gamma_d = \frac{(1-n_a)G\gamma_w}{1+e}$
b.	Explain flow net. Describe its properties and its applications.
c.	A normally consolidated clay layer of 10m thickness has a unit weight of 20 kN/m^2 and specific gravity of 2.72. The liquid limit of the clay is 58%. A structure constructed on the clay increases the overburden pressure by 10%. Estimate the consolidation settlement.
d.	Describe the unconfined compression test? What is its advantage over a triaxial teat?
e.	Using Terzaghi's theory, determine the ultimate bearing capacity of a strip footing 1.5 m wide resting on a saturated clay (c_u = 30 kN/m^2, φ_u =0 and γ_{sat} = 20kN/m^3), at a depth of 2 m below ground level. The water table is also at a depth of 2m from the ground level. If the water table rises by 1 m, calculate the percentage reduction in the ultimate bearing capacity.

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

(a)	Saturated clay has a water content of 39.3% and a mass specific gravity of 1.84. Determine the void ratio and the specific gravity of soil solids.
(b)	The liquid limit of clay is 64% and its plastic limit is 34%. Its natural water is 48%. What is the liquidity index of the soil? How do you classify the soil as per the IS classification?

Paper Id: 100516 **Roll No:** | | | | | | | | | | | | | |

4. Attempt any *one* part of the following: 7 x 1 = 7

(a)	A granular soil deposit is 7 m deep over an impermeable layer. The ground water table is 4 m below the ground surface. The deposit has a zone of capillary rise of 1.2 m with a saturation of 50%. plot the variation of total stress, pore water pressure and effective stress with the depth of deposit, e = 0.6 and G = 2.65.
(b)	A soil sample 90 mm high and 6000 mm^2 in cross-section as subjected to a falling-head permeability test. The head fell from 500 mm to 300 mm in 1500 sec. The permeability of the soil was $2.4x10^{-3}$ mm/sec. Determine the diameter of the stand pipe.

5. Attempt any *one* part of the following: 7 x 1 = 7

(a)	Describe standard proctor test and the modified proctor test.
(b)	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 m_v is 1.5×10^{-3} m^2/kN. Determine the coefficient of consolidation (in m^2/yr) and the coefficient of permeability (in m/yr).

6. Attempt any *one* part of the following: 7 x 1 = 7

(a)	Explain the Skempton's pore pressure parameters in detail.
(b)	How a slope is analyzed using Swedish circle method? Derive an expression for the factor of safety.

7. Attempt any *one* part of the following: 7 x 1 = 7

(a)	Define the following terms (i) Net safe bearing capacity (ii) Gross safe bearing capacity (iii) Allowable soil pressure
(b)	A group of 9 piles, 10 m long is used as a foundation for a bridge pier. the piles used are 30 cm diameter with centre to centre spacing of 0.9 m. the subsoil consists of clay with unconfined compressive strength of 1.5 kg/cm^2. Determine the efficiency neglecting the bearing action. α =0.9