Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[5559]-103

S.E. (Civil) (First Semester) EXAMINATION, 2019
GEOTECHNICAL ENGINEERING
(2015 PATTERN)

Time : 2 Hours **Maximum Marks : 50**

N.B. :— (*i*) Answer Q. **1** *or* Q. **2**, Q. **3** *or* Q. **4**, Q. **5** *or* Q. **6** and Q. **7** or Q. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of Calculator is allowed.

(*v*) Assume suitable data if necessary.

Q1) a) Describe the method of determining the grain size distribution of cohesionless soils. Also discuss the significance of the values of uniformity coefficient and coefficient of curvature. [6]

b) Define Total, effective stress in soil. The soil at the toe of a dam is fully saturated and has water content of 35 % and specific gravity of soil grains 2.65. For safety measures against piping, the exit gradient is restricted to 20% of the critical hydraulic gradient. Calculate the permissible exit gradient. [6]

OR

Q2) a) The bulk density of soil sample is 18 kN/m^3. The specific gravity of soil solids is 2.70 and moisture content 15%. Calculate void ratio, porosity, degree of saturation and dry unit weight. [6]

b) Derive the equation for coefficient of permeability in a fully penetrating unconfined aquifer along with a neat sketch. [6]

Q3) a) Two identical soil specimens were tested in a triaxial apparatus. First specimen failed at a deviator stress of 770 kN/m^2 when the cell pressure was 200 kN/m^2. Second specimen failed at a deviator stress of 1370 kN/m^2 under a cell pressure of 400 kN/m^2. Determine the value of c and ϕ analytically. If the same soil is tested in a direct shear apparatus with a normal stress of 600 kN/m^2 , estimate the shear stress at failure. [6]

P.T.O.

b) State factors affecting compaction and explain any two of them [6]

OR

Q4) a) An elevated structure with a total weight of 600 KN is supported on a tower with 3 legs. The legs rest on piers located at the corners of an equilateral triangle with sides of 6m. What is the vertical stress increment due to this loading at a point 5m below one of the legs of the structure? [6]

b) State the shear tests which can be performed in the laboratory and explain any one with neat sketch and involved formulae [6]

Q5) a) Determine the relation for lateral earth pressure in active state for dry cohesionless backfill with uniform surcharge. [6]

b) A retaining wall 10m high retains a cohesionless soil having an angle of internal friction of 30^0. The surface of the soil is level with the top of the wall. The top 3m of the fill has a unit weight of 20 kN/m^3 and that of the rest is 30 kN/m^3. Find the magnitude per meter run and point of application of the resultant active thrust. Assume Φ same for both the strata. [7]

OR

Q6) a) A smooth vertical wall retains a level backfill with $\gamma = 18.5$ kN/m3, $\phi = 30°$ and C = 0 to a depth of 10 m. Draw the lateral pressure diagram and compute the total thrust on the retaining wall. What will be the active pressure if water stands at a depth of 4 m? [7]

b) Explain step by step procedure for Rebhann's Graphical method for determination of active pressure. [6]

Q7) a) Enlist factors of safety used in stability analysis of slopes. [6]
Calculate the factor of safety w.r.t. cohesion, of a clay slope laid at 1 in 2 to a height of 10m, if the angle of internal friction $\phi = 10°$ and c = 25 kN/m^2 and $\gamma = 19$kN/m^3. What will be the critical height of the slope in this soil. Assume $S_n = 0.064$ for $\phi = 10°$.

b) State and describe the zones in the contaminated soil strata below the waste dump and how is their extent determined? [7]

OR

Q8) a) What are the basic modes of failure of earth slopes? Briefly outline the remedial measures that can be undertaken against failure of slopes. [6]

b) What is subsurface contamination? Which are the remedial measures to reduce its effect? Explain any one [7]