Printed pages: 2 **Sub Code: RCE307**

Paper Id | 0 | 0 | 1 | 2 | **Roll No.** | | | | | | | | | | |

B. TECH.
(SEM III) THEORY EXAMINATION 2017-18
SOIL MECHANICS

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

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

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

a. Define void ratio and write the relation between void ratio and porosity.
b. Define transported and residual soil.
c. What do you understand by Index properties of soil?
d. What is relative density?
e. Differentiate between compaction and consolidation.
f. Define active earth pressure
g. Write short note on effective stress.

.

SECTION B

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

a. A sample of clay was coated with paraffin wax and its mass, including the mass of wax, was found to be 697.5 gm. The sample was immersed in water and the volume of the water displaced was found to be 355 ml. The mass of the sample without wax 690.0 gm, and the water content of the representative specimen was 18%. Determine the bulk density, dry density, void ratio and the degree of saturation. The specific gravity of the solids was 2.70 and that of wax 0.89m

b. Two clay specimens A and B, of thickness 2 cm and 3 cm, have equilibrium voids ratios 0.68 and 0.72 respectively under a pressure of 200 kN/m^2.If the equilibrium void ratios of the two soils reduced to 0.50 and 0.62 respectively, when the pressure was increased to 400kN/m^2, find the ratio of co-efficient of permeability of the two specimens. The time required by the specimen A to reach 40 percent degree of consolidation is ¼ of that required by specimen B for reaching same degree of consolidation.

c. The principal stresses at a point in a material are 80 kN/m^2 and 40 kN/m^2. Determine the normal, shear and resultant stress on a plane inclined at 30^o to the major principal plane. Find also, for this plane, the maximum value of obliquity.

d. What are different types of earth pressure? What are the assumptions of Rankine's theory? Derive the expression for active pressure.

e. A sand deposit is 10 m thick and overlies a bed of soft clay. The ground water table is 3 m below the ground surface. If the sand above the ground water table has a degree of saturation of 45%, plot the diagram showing the variation of the total stress, pore water pressure and the effective stress. The void ratio of the sand is 0.70. Take G = 2.65.

SECTION C

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

(a) A fully saturated clay sample has a mass of 130 gm and has a volume of 64 cm^3.The sample mass is 105 gm after oven drying. Assuming that the volume does not change during drying, determine the following :
(i) Specific gravity of soil solids (ii) void ratio (iii) porosity (iv) dry density .

(b) Differentiate between :
(i) percentage air voids and air contents
(ii) Void ratio and porosity
(iii) Specific gravity of solids and mass specific gravity

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

(a) State the assumptions made in computing stresses below the ground surface due to a point load acting on it.
A concentrated load of 50 kN acts on the surface of a homogeneous soil mass of large extent. Determine the stress intensity at a depth of 5 m , directly under the load, and at a horizontal distance of 2.5 m.

(b) What is darcy's law? What are its limitations?
A constant-head permeability test was run on a sand sample 30 cm in length and 20 cm^2 in area. When a loss of head was 60 cm, the quantity of water collected in 2 minutes was 250 ml. Determine the coefficient of permeability of the soil.

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

(a) In a laboratory, the consolidation test was performed on a specimen of clay 3 cm thick. The sample was drained at top and bottom. The time required for 50% consolidation of the sample was observed to be 15 minutes. Determine the coefficient of clay.
Calculate time required for 50% and 90% consolidation for this clay deposit in the field 3 m thick and drained at both ends.

(b) Describe direct shear test. What are its merits and demerits?.

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

(a) A retaining wall has a vertical back and is 8 m high. The back face of the wall is smooth and the upper surface of the fill is horizontal. Determine the thrust on the wall per unit length. Take c = 10 kN/m^2,Y= 19kN/m^3 and $\phi = 20^o$. Neglect tension

(b) A long natural slope in an over consolidated clay ($c' = 10kN/m$, $\phi' = 25^o$, $Y_{sat} = 20kN/m^2$) is inclined at 10^o to the horizontal. The water table is at the surface and the seepage is parallel to the slope. If a plane slip had developed at a depth of 5 m below the surface, determine the factor of safety. Take $Y_w = 10kN/m^3$?

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

(a) What is geologic cycle? Explain the phenomena of formation and transportation of soils.

(b) Discuss various methods for determination of water content in a laboratory.