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B 2090

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Fourth Semester

Civil Engineering

CE 240 — SOIL MECHANICS

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

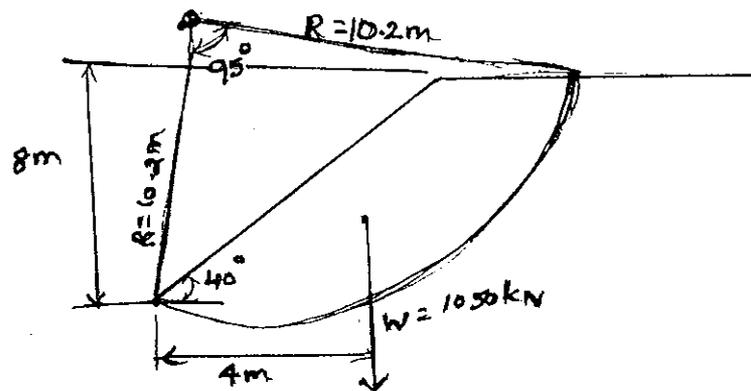
1. Define "Soil Mechanics".
2. Define the terms plasticity index and saturated mass density.
3. List the various factors that affect co-efficient of permeability.
4. Define co-efficient of permeability and seepage velocity.
5. What is meant by pressure bulb? What is its significance?
6. State any four assumptions one-dimensional consolidation theory.
7. Which are called as shear strength parameters? Why?
8. State the types of shear in unconfined compression and vane shear test.
9. State any two difference between method of slices and friction circle method.
10. When and where the circular failure surface is mobilized? Why?

PART B — (5 × 16 = 80 marks)

11. (a) An infinite slope has an inclination of 26° with the horizontal. It is underlain by a firm cohesive soil having $G = 2.72$ and $e = 0.52$. There is a thin weak layer 6m below and parallel to the slope ($c^1 = 300\text{kN/m}^2, \phi^1 = 16^\circ$) compute the factors of safety when
- The slope is dry and
 - Ground water flows parallel to the slope at the slope level.

Or

- (b) A 40° slope is excavated to a depth of 8m in a deep layer of saturated clay having strength parameters $C = 60\text{ kN/m}^2, \phi = 0$, and $\gamma = 19\text{kN/m}^2$. Determine the factor of safety for the trial failure surface shown in fig 11. B.



Not to scale

Fig. 11 (B).

12. (a) 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 effective stress shear strength parameters.

Or

- (b) A direct shear test on specimens of fine sand gave the following results.

Normal stress (KN/m ²)	100	175
Shearing stress (KN/m ²)	46	81

Determine :

- (i) The angle of internal friction of the soil, and
 - (ii) Shear strength of soil at a depth of 5m from the ground surface. Assume specific gravity of solids is 2.65, void ratio 0.7 and the ground water table is at a depth of 2m from the ground surface.
13. (a) A single concentrated load of 1000 KN acts at the ground surface. Construct an isobar for $\sigma_z = 40\text{KN/m}^2$ by making use of Boussinesq's equation.

Or

- (b) A laboratory sample of clay 2cm thick took 15 min to attain 60 percent consolidation under a double drainage condition. What time will be required to attain the same degree of consolidation for a clay layer 3m thick under the foundation of a building for a similar loading and drainage condition, what is the value of C_v .
14. (a) A sand deposit contains three distinct horizontal layers of equal thickness. The co-efficient of permeability of the upper and lower layers is 10^{-3}cm/sec and that of the middle is 10^{-2}cm/sec . What are the values of the horizontal and vertical co-efficients of the three layers and what is their ratio?

Or

- (b) (i) A sand sample of 35 cm² cross-sectional area and 20 cm long was tested in a constant head permeameter, under a head of 60 cm, the discharge was 120 ml in 6 min. The dry weight of sand used for the test was 1120g, and $G = 2.68$. Determine
- (1) The co-efficient of permeability in cm/sec.
 - (2) The discharge velocity, and
 - (3) The seepage velocity. (10)
- (ii) Explain the meaning of capillary siphoning and its practical application. (6)

15. (a) A sample of clay soil has liquid limit of 62%, and its plasticity index is 32%. What is the state of consistency of the soil if the soil in its natural state has a water content of 34% calculate the shrinkage limit if the void ratio of the sample at the shrinkage limit is 0.70. Assume $G = 2.70$?
(4 + 12)

Or

- (b) A sample of sand above water table was found to have a natural moisture content of 15% and a unit weight of 18.84 KN/m^3 . Laboratory tests on a dried sample indicated values $e_{\text{min}} = 0.50$ and $e_{\text{max}} = 0.85$ for the densest and loosest states respectively. Compute the degree of saturation and the density index. Assume $G = 2.65$.
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