

AU – 2841

Seventh Semester B. E. (Civil Engineering) (CGS) Examination

ADVANCE GEOTECHNICAL ENGINEERING

Paper – 7 CE 05

(USC – 10218)

P. Pages : 4

Time : Three Hours]

[Max. Marks : 80

- Note :**
- (1) Due credit will be given to neatness and adequate dimensions.
 - (2) Assume suitable data wherever necessary.
 - (3) Diagrams and Chemical equations should be given wherever necessary.
 - (4) Retain the construction lines.
 - (5) Illustrate your answer wherever necessary with the help of neat sketches.
 - (6) Discuss the reaction, mechanism wherever necessary.
 - (7) Use pen of Blue/Black ink/refill only for writing the answer book.

1. (a) Name the predominant clay minerals. Explain their structure and composition. List their properties.
- (b) Explain what is meant by base exchange capacity.

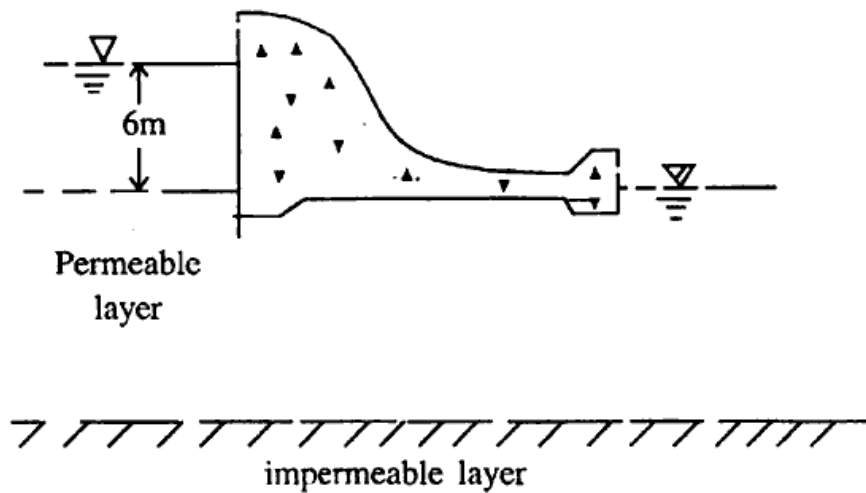
OR

2. (a) Discuss the X-ray diffraction method of clay mineral identification.
 - (b) What are the different types of bonds in clay minerals ?
-
3. (a) Discuss in detail procedure for plotting a flownet for hydraulic structure resting on anisotropic material.

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- (b) A dam section shown below Fig. no. 3 (b). The coefficient of permeability of the permeable layer in the vertical and horizontal direction are 2×10^{-2} m/s and 4×10^{-2} m/s, respectively. Draw a flownet and calculate the seepage loss of the dam in $\text{m}^3/\text{dam m}$.



OR

4. (a) Discuss the deflection of flow lines at the interface of dissimilar soil with different coefficient permeabilities and hence prove,

$$\frac{\tan \delta_1}{\tan \delta_2} = \frac{K_1}{K_2}$$

where, δ_1 and δ_2 are angle of deflection of flow line ψ_1 and ψ_2 with the normal to the interface respectively and K_1 and K_2 are the coefficient of permeabilities of soil no. 1 and 2 respectively.

- (b) Draw a flownet for seepage through a zoned earth dam section. The soil for the upstream half of the dam has a permeability K_1 , and the soil for the downstream half of the dam has a permeability, $K_2 = 5K_1$. How the rate of seepage to be calculated ?
5. (a) Explain in brief assumptions for three dimensional consolidations and hence derive basic three dimensional consolidation equation.
- (b) Explain in brief free strain and equal strain condition in sand drains.

OR

6. (a) Discuss the consolidations of expansive soils by vertical sand drains and their design criteria.
(b) What is coefficient of consolidation ? How is it determined ?
7. (a) Discuss the effect of smear zone on radial consolidation
(b) A 7m thick clay layer is drained at the top and bottom and has sand drains. The given data are as follows :
The coefficient of consolidation is $4.92 \times 10^{-3} \text{ m}^2/\text{day}$ for vertical drainage. $K_{\text{vertical}} = K_{\text{horizontal}}$, diameter of equivalent circle $d_e = 2.30 \text{ m}$, diameter of sand drains $c/w = 0.50 \text{ m}$, Let $r_w = r_s$ (μ no smear at the periphery of drains wells.)
It has been estimated that a given uniform surcharge would cause a total consolidation settlement of 250 mm without the sand drains. Calculate the consolidation settlement of the clay layer with the same surcharge and sand drains at time $t = 0.0, 0.2, 0.4, 0.6$ years. <http://www.sgbauonline.com>

OR

8. (a) Explain in brief design aspect of vertical sand drains.
(b) For a sand drain, the following data are given,
 $r_w = 0.4 \text{ m}$, $r_e = 1.52 \text{ m}$, $r_w = r_s$,
and $C_{vr} = 0.01 \text{ m}^2/\text{day}$. A uniformly distributed load of 20 KN/m^2 is applied at the ground surface. Determine the distribution of excess pore water pressure after 10 days of load application assuming radial drainage only.
9. (a) Discuss the swelling potential, and thus swelling pressure of expansive soil, and also discuss the factors affecting it.
(b) Discuss various method of foundation design in expansive soils for building.

OR

10. (a) One storey load bearing house to be built on a site that is underlain by a clay with a plasticity index of 40. Might this house be prone to distress due to expansive soils ? Why or why not ?

- (b) How the expansive soils are identified ? How they are classified ? State common preventive measures adopted for pavement construction on such expansive soil.

11. (a) How will you stabilize the soil using different admixtures ?
(b) Discuss the use of lime in stabilisation of soil. What are the chemical and physical changes which take place in lime stabilisation ?

OR

12. (a) What are the major functions of geosynthetic material ? Explain each function with an example from various projects.
(b) Geosynthetic can be used as soil reinforcement—justify in detail with supporting sketches.



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