M.E. First Semester (Civil Engg. (Geotechnical Engg.)) (Full Time) (C.G.S. - New)

13043 : Advanced Soil Mechanics : 1 SFGE 2

P. Pages : 3 | AU - 3474

Time : Three Hours | Max. Marks : 80

Notes :
1. All question carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Diagrams and chemical equations should be given wherever necessary.
5. Illustrate your answer necessary with the help of neat sketches.
6. Discuss the reaction, mechanism wherever necessary.
7. Solve **any five** questions.

1. a) Deduce the conditions for the following cases and state the field example in each cases. **8**
   i) Planestrain
   ii) Plane stress

   b) Discuss the degree isotropy of soil element with reference to elastic constants. **8**

2. a) Construct Mohr circle for the following cases, **8**
   i) Spherical stress matrix.
   ii) Deviator stress matrix

   b) Determine the principal stresses and octahedral normal and shear stresses. **8**

$\sigma x = 25 kN/m^2$ $\quad \tau xy = 30 kN/m^2$

$\sigma y = 40 kN/m^2$ $\quad \tau yz = -61 kN/m^2$

$\sigma z = 17 kN/m^2$ $\quad \tau xz = -10 kN/m^2$

3. a) What are the different types of earth pressure? Explain active earth pressure and passive earth pressure. **8**

   b) For the retaining wall and backfill shown in fig. No. 3 (a) use Culmann's method to determine the value and point of application of active earth pressure on the wall. Find the effect of a line load 40kN/m, located 4m far from point A. Determine also the distance at which the line load will not affect the active earth pressure on the wall. **8**

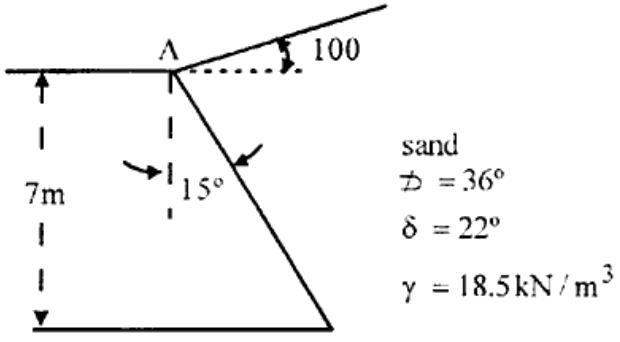
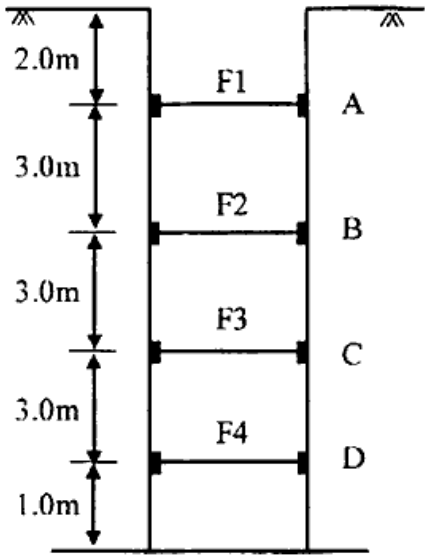


Fig. No. 3(a)

4. a) Describe the method for the design of various components of a braced cut, stating clearly the assumptions made. **8**

b) The braced excavation system shown in fig. No. 4 (b) is proposed for a 12m deep excavation in clays, where the unconfined compressive strength is 90kPa and saturated unit weight is 18.9kN/m^3. Determine the strut load if the struts are spaced at 3.5m intervals horizontally. **8**



5. a) Explain and state 3D consolidation equation with diagram and assumption made in developing the equation. Also state the importance of 3D consolidation in geotechnical application. **8**

b) During the construction of a highway bridge, the average permanent load on the clay layer is expected to increase by about 115kN / m^3. The average effective overburden pressure at the middle of the clay-layer is 210kN/m^2. Here, the sand drain is provided with H_C = 6m, C_C = 0.28, e_O = 0.9 and C_V = 0.36m^2/month. The clay is normally consolidated. Assume that r_w = 0.1m, de = 3m, $C_V = C_{VT}$, and the surcharge is applied instantaneously. Also assume that this is a no-smear case. Table shows the value of Tr
Determine, **8**

i) The total primary consolidation settlement of the bridge without pre-compression.
ii) Degree of consolidation achieved due to provision of vertical sand drain in nine month.

Table : Time factor T_r for various values of n

Degree of consolidation Ur %	n = 10	n = 15	n = 20
76	0.2816	0.3517	0.4021
77	0.2900	0.3621	0.4141
78	0.2988	0.3731	0.4266
79	0.3079	0.3846	0.4397

6. a) Explain the procedure to draw a flow net for non homogenous soil mass with diagram. **8**

b) Fig. No. 6 (b) represent a portion of a flownet in the vicinity of a vertical boundary ACB separating two isotropic soil 1 and soil 2. The flownet has been drawn using square shapes with point C at the corner of a square on each side of the boundary. The scale of the whole figure maybe determined from the 2m size square in soil 1. The seepage flow (q) through each flow tube is $4\times10^{-7}\,m^3$ / sec/ m if the permeability for soil 1 is 10^{-4} cm / sec. **8**

i) Determine the permeability in soil 2

ii) The difference in pressure head between points D and E.

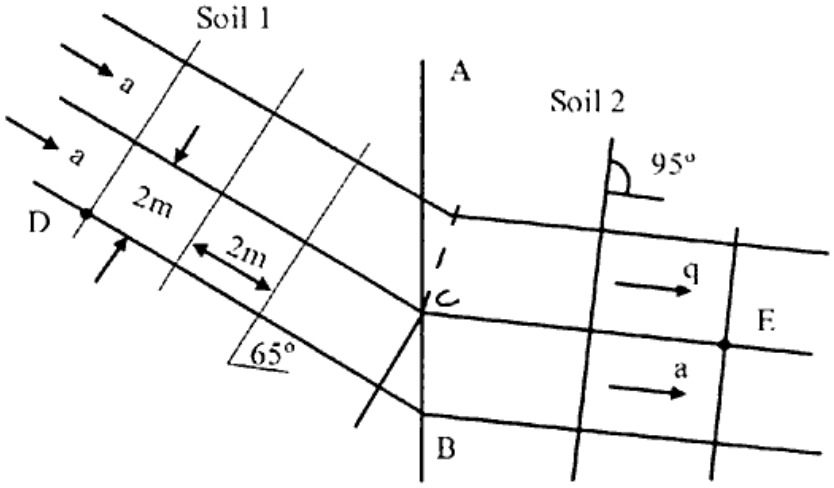


Fig. No. 6 (b)

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