Printed Pages : 4

Roll No. ....

320553(20)

BE (5ᵗʰ Semester)
Examination, Nov.-Dec., 2018
(New Scheme)
Geotech Engineering - I

Time Allowed : 3 hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : (i)   Part (a) of each question is compulsory carrying 2 marks each. Solve any **two** from remaining (b), (c), (d) carrying 7 marks each.
(ii) Take $\gamma_w = 10$ kN/m³, $\rho_w = 1$ g/cm³

Unit-I

1. (a) If the porosity of the soil sample is 20%, the void ratio is   [2]
   (i) 0.20 (ii) 0.80 (iii) 1.00 (iv) 0.25

   (b) An airport runway fill needs 600,000 m³ of the soil compacted to a void ratio of 0.75. There are two borrow pits A and B from where the required soil can be taken and transported to the site.

Borrow pit	In situ void ratio	Transportation cost
A	0.80	Rs 10/m³
B	1.70	Rs 5/m³

   Which of the two borrow pits would be more economical?   [7]

(Turn Over)

[2]

(c) A partially saturated sample from a borrow pit has a natural moisture content of 15% and bulk density of 1.9 g/cc. The specific gravity of solids is 2.70. Determine the degree of saturation and void ratio. What will be the unit weight of the sample (kN/m³) of the sample on saturation?   [7]

(d) Describe liquid limit, plastic limit, shrinkage limit and plasticity index.   [7]

Unit-II

2. (a) The coefficient of curvature is defined as   [2]
   (i) D_{60}/D_{10} (ii) D_{10}/D_{60}
   (iii) $D_{30}^2/D_{60}D_{10}$ (iv) $\dfrac{D_{10}^2}{D_{30}^2}$

   (b) Explain IS system of soil classification.   [7]

   (c) What is the condition, when water is flowing upward direction in soil? Explain.   [7]

   (d) For the subsoil conditions shown in Fig. draw the total, neutral and effective stress diagrams up to a depth of 8 m. Neglect capillary flow.   [7]
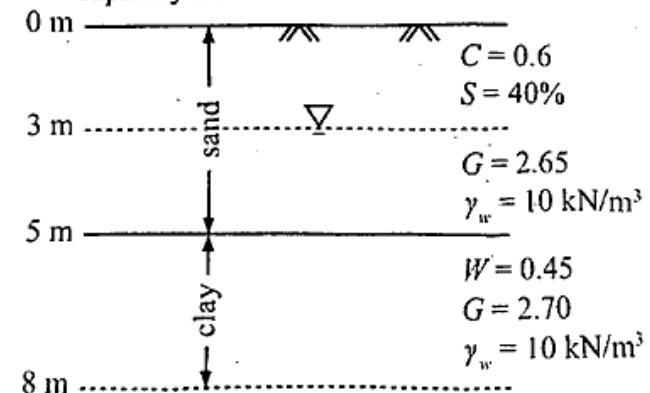
(Continued)

[3]

Unit-III

3. (a) According to Darcy's law for flow through porous media the velocity is proportional to [2]
   (i) effective stress   (ii) hydraulic gradient
   (iii) cohesion   (iv) stability number

   (b) Derive expression for average permeability: [7]
   Case 1: Parallel to bedding planes
   Case 2: Perpendicular to bedding planes

   (c) Define MDD and OMC, during watering process in subgrade layer of highway. What are their importance? [7]

   (d) Given data:

 | Maximum dry density | 1.8 g/cc or 1.8 g/cm³ |
   |---|---|
   | OMC | 16% |
   | G | 2.65 |
   | ρ_w | 1 g/cm³ |

   What is the degree of saturation?
   What is the maximum dry density it can further compacted to? [7]

Unit-IV

4. (a) The unit of coefficient of consolidation is: [2]
   (i) cm²/gm   (ii) cm²/sec
   (iii) gm/cm²/sec   (iv) gm-cm/sec

   (b) Explain Newmark's influence chart. [7]

   (c) Differentiate between compaction and consolidation. [7]

   (d) According to Fig. primary consolidation at A is estimated to complete in 36 months. What would be the corresponding time for completion of primary consolidation at B? [7]

(Turn Over)

[4]

Uniform surcharge

5 m — Saturated clay
Thin sand layer
5 m — Saturated clay
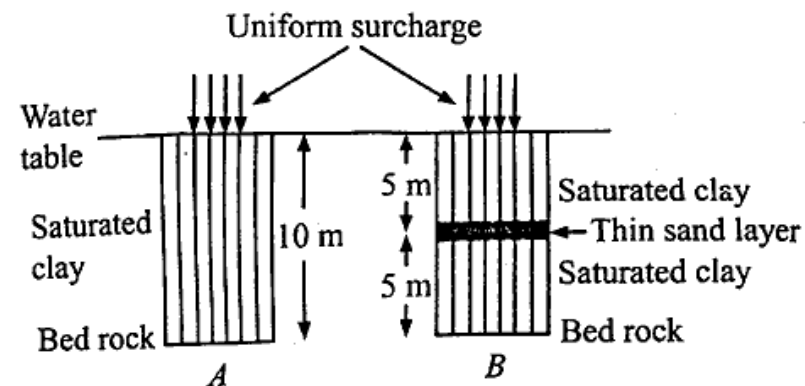
Unit-V

5. (a) For a sample of dry, cohesionless soil with friction angle ϕ, the failure plane will be inclined to the major principal plane by an angle equal to [2]
   (i) ϕ (ii) 45°
   (iii) 45° − ϕ/2   (iv) 45° + ϕ/2

   (b) Give lists of various methods of driving holes for subsurface investigations. [7]

   (c) Describe the test procedure of direct shear test. [7]

   (d) Given data:

Name	Value
Major principal stress	300 kN/m²
Minor principal stress	100 kN/m²

   If, for the same soil, the minor principal stress has been 200 kN/m², determine the major principal stress for [7]
   (i) $\phi = 30°$ (ii) $\phi = 0°$

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