

Final Assessment Test - November 2019 CLE1004 Soil Mechanics and Foundation Engineering

Max. Marks: Mo

Time: Three Hours

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS EXAM MALPRACTICE

Instructions:

General Instructions:

1) Use of IS: 6403-1981 is permitted

2) Use of IS: 2911(Part 1)-2010 is permitted

3) Assume values wherever necessary

Answer any TEN Questions (10 X 10 = 100 Marks)

- There are two borrow areas A and B which have soils with void ratios of 0.80 and 0.70, respectively. The in-place water content is 20% and 15% respectively. The fill at the end of construction will have a total volume of 10,000 m³, bulk density 1.5 Mg/m³ and a placement water content of 22%. Determine the volume of the soil required to be excavated from both areas. Take G = 2.65. If the cost of excavation of soil and transportation is Rs. 200-/- per 100 m³ for area A and Rs. 220-/- per 100 m³ for area B, which of
- a) A soil specimen is 38 mm in diameter and 76 mm long and in its natural condition weighs 168.0 g. the borrow area is more economical? When dried completely in an oven the specimen weighs 130.5 g. The value of Gris 2.73. What is the 2. degree of saturation of the specimen?
 - b) The following data for a falling head permeability test: Length of the soil sample= 150 mm, Area of the soil sample = 1964 mm²; Area of the standpipe = 25 mm²; At time t = 0, head difference =400 mm; At time t = 8 min, head difference = 200 mm. (a) Determine the hydraulic conductivity of the soil (cm/sec). (b) What was the head difference at t= 6 min?
- The soil profile at the bottom of a valley comprises 2 m of sand overlying 10 m of clay. The clay layer itself ir resting on highly permeable weathered sandstone. The unit weight of sand above the water table, which is 1 m below the ground level, is 16 kN/m³, and below the water table, it is 20 kN/m³. The saturated unit weight of clay is 22 kN/m3. If the water table in the sandstone layer is under artesian conditions, corresponding to a stand pipe level of 5 m above the ground level, plot the variation of the (i) total stress, (ii) pore water pressure and (iii) effective stress with depth such as at the ground level, ground water table, top of clay layer, bottom of the clay layer and a little distance into the sandstone layer.
- a) A circular foundation rests on the horizontal upper surface of a semi-infinite soil mass whose properties comply with the usual elasticity requirements, and carries a load of 1000 kN. The contact 4. pressure is uniform and the foundation is flexible. The base of the foundation is frictionless. The diameter of the foundation is 3 m. Determine the vertical stress distribution on horizontal planes along the central axis of the foundation to a depth of 10 m below the surface.
 - b) A rectangular area 4 m X 2 m carries a uniform load of 80 kN/m² at the ground surface. Find the vertical pressure at 5 m below the centre of the loaded area using the equivalent point load method.
 - A 3 m thick clay layer beneath a building isoverlain by a permeable stratum and is underlain by an impervious rock. The coefficient of consolidation of the clay was found to be 0.025 cm2/ minute. The final expected settlement for the layer is 8cm.
 - a) How much time will take for 80% of the total settlement to take place?
 - b) Determine the time required for a settlement of 2.5 cm to occur.
 - c) Compute the settlement that would occur in one year

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