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Dr Saurabh Rawat

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

MID SEMESTER EXAMINATION-2015

B.Tech. IV Semester

COURSE CODE: 10B11CE411 MAX. MARKS: 30

COURSE NAME: GEOTECHNICAL ENGINEERING

COURSE CREDITS: 4 MAX. TIME: 2 HRS

Note: *All questions are compulsory.*

Assume data wherever necessary.

Section A **(Marks: 1×6 = 6)**

State whether the following statements are true or false, give REASONS for the respective answer:

1. Soils transported by wind are deposited in a sorted state.
2. When two soils have the same plasticity index, the one with higher liquid limit has a greater compressibility and a smaller rate of volume change.
3. The natural water content of saturated quartz sand is 20%: its void ratio is likely to be about 0.55.
4. Permeability of a soil is a function only of the soil and not of the permeant.
5. Kaolinite mineral is 2:1 mineral.
6. When the water level in a tank rises, the effective stress in the soil below is also increased.

Section B **(Marks: 3×3 = 9)**

1. Prove that shrinkage limit (w_s) can be determined by $W_S = \left[\frac{\gamma_w}{\gamma_d} - \frac{1}{G}\right] \times 100$
2. A Pycnometer test for the determination of water content of a soil sample having $G_s = 2.70$ yielded the following data:

   Wt. of moist soil = 230.75gms
   Wt. of Pycnometer full of water = 2965.20 gm
   Wt. of Pycnometer + soil + water = 3092.85 gm
   Calculate the water content of the soil.

3. The Atterberg's limits of a given soil are LL = 60%, PL = 45% and SL = 25%. The specific gravity of the soil solids is 2.67. A sample of this soil at liquid limit has a volume of 20 cc. What will be its final volume if the sample is brought to its shrinkage limit?

Section C (Marks: 5×3 = 15)

1. At a site the subsoil consists of a 8m thick layer of dry sand (G = 2.65; e = 0.85; D_{10} = 0.14 mm) which is underlain by a 6m thick clay layer (G = 2.75; w = 22%) below which there exists a thick layer of rock. The water table is located at a depth of 6m below the ground level. If there exists a capillary rise in the sand layer, plot the distribution of total, neutral and effective stresses.
2. Soil is required to be excavated from a pit for a construction of an embankment of height 6m. Top width of the embankment is 2m, side slopes 1(V): 2(H). The unit weight of undisturbed soil in bulk condition is 18kN/m^3 with water content of 8%. The dry density required in the embankment is 20kN/m^3 with water content of 10%. Specific gravity of soil solids is 2.70. Estimate:
    a. The weight of soil required to be excavated from the pit to construct 1m length of embankment.
    b. The number of trips needed to bring soil from pit by a truck which has capacity to carry 80kN/trip.
    c. The porosity (n) and Degree of Saturation (S) of the embankment soil.
3. A falling head permeability test was carried out carried out on a 15cm long sample of silty clay. The diameter of the sample and the stand- pipe were 9.8cm and 0.75cm respectively. The water level in the stand – pipe was observed to fall from 60cm to 45cm in 12 minutes. Determine:
    a. The coefficient of permeability of the soil in m/day.
    b. Height of water level in the stand pipe after 20 minutes.
    c. Time required for the water level to drop to 10cm.