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B.E / B.Tech. (Full Time) DEGREE ARREAR EXAMINATIONS, APR / MAY 2014

AGRICULTURAL AND IRRIGATION ENGINEERING BRANCH

IV SEMESTER – (REGULATIONS: 2008)

AI 9251 – SOIL SCIENCE AND ENGINEERING

Time : 3 hours.

Max Marks: 100

Answer ALL Questions

Part – A (10 x 2 = 20 Marks)

1. How porosity of soil affects the status of soil temperature.
2. What are soil moisture constants?
3. Define the term submerged density and saturation density of soil.
4. The mass of a moist sample of soil is 25 gm when measured on a tin lid of mass 16 gm. After drying in an oven for 24 hours at 105°C, the mass of the tin and sample is 23 gm. calculate the moisture content of the soil.
5. Compare between constant and falling head permeameter.
6. Write short notes on Flow nets.
7. What is the minimum depth required for a foundation to transmit a pressure of 74 KN/m² in a sandy soil with a specific weight of soil as 18 KN/m³ and frictional angle is 19°. What will be the bearing capacity if a depth of 1.65 m is adapted to Rankine's formula?
8. What is raft foundation? When is it preferred?
9. Write the types of soils in different zones of Tamil Nadu.
10. Differentiate between saline and alkaline soils.

Part – B (5 x 16 = 80 Marks)

11. i) Explain briefly the influence of soil reaction on nutrients availability to plants with a neat sketch? (12)
ii) Differentiate between soil and sub-soil. (4)
12. a i) Describe briefly on Atterberg limits of consistency of soils? (8)
ii) Explain how the shrinkage limit of soil is determined in the laboratory with neat sketch. (8)

OR

- b. Describe briefly three types of field compaction and instruments and explain the HRB, USC and Indian standard soil classification? (16)
13. a. i) What is Coulomb's equation for shear strength of soils? Discuss the factors which affect the shear strength parameters of soil. (8)
ii) Calculate the intensities of active and passive earth pressure at a depth of 8m in dry cohesionless soil with an angle of internal friction of 30° and unit weight of 18 KN/m³. What will be the intensities of active and passive earth pressure, if the water level rises to ground level? Take the saturated unit weight of sand as 22 KN/m³. (5)
iii) Write short notes on shear test of soils. (3)

OR

- b i) Explain how the direct shear test is carried out in the laboratory with neat sketch. (8)
 ii) A sample of filter sand was tested in a constant head permeameter. The size of the space for the sample in the permeameter was 11 cm (diameter) and 15 cm (height). A hydrostatic head of 50 cm was applied for a period of 10 sec, and a quantity of water equal to 3000 cc was collected. Find the coefficient of permeability of sand. (8)
14. a i) What is foundation? Explain with neat sketches the different types of shallow foundations. (10)
 ii) A square footing is located at a depth of 1.3 m below the ground level has a safe load of 800 KN. Find the size of the footing, if the factor of safety is 3. The soil has the following properties void ratio=0.55, specific gravity =2.67, cohesionless of soil= 8 KN/m², frictional angle=30°. Use Terzaghi equation $N_c=37.2$, $N_q=22.5$ and $N_\gamma=19.7$. (6)
- OR
- b i) Explain the method of slices for stability analysis of slopes. How can steady seepage be accounted for in this method? (8)
 (ii). Explain general shear failure and local shear failure. Differentiate between (i) Shallow foundation and deep foundation (ii) Gross and net bearing capacity (iii) Safe bearing capacity and allowable soil pressure. (8)
15. a i) Describe the Alluvium, Red, Black, soils groups of India as per ICAR? Briefly explain the characteristics of each group, particularly in references to the engineering properties of the available soils. (12)
 ii) With the help of a diagram describe the soil profile. (4)
- OR
- b. i) Name all the orders of USDA Soil Taxonomical Classification, and describe the four most important among the orders found in India. (10)
 ii) Write the objectives and uses of soil survey? Explain the detailed and reconnaissance survey. (6)
