B.E / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATION, APR / MAY 2011

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.   What is hygroscopic water?
2.   Distinguish between Nitrification and Ammonification.
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.   What is coefficient of permeability?
6.   Define Darcy's law?
7.   What is the minimum depth required for a foundation to transmit a pressure of 74 KN/m^2 in a sandy soil with a specific weight of soil as 18 KN/m^3 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.   Differentiate between general and local shear failure
9.   Write the types of soils in different zones of Tamil Nadu.
10. What are the important soil forming minerals? How are soils formed?

Part – B (5 x 16 = 80 Marks)

11.   i) Name all the orders of USDA Soil Taxonomical Classification, and describe the four most important among the orders found in India.   (10)
ii) Explain the role of nitrogen and potassium in plant growth and symptoms?   (5)
iii) Calculate the total porosity of a soil when the particle density is 2.65 g/cm^3 and the bulk density of soil is 1.56 g/cm^3.   (1)

12. a i) Describe briefly on Atterberg limits of consistency of soils?   (8)
ii) An undisturbed soil sample has a volume of 100 cm^3 and a mass of 186 gm, on oven drying for 24 hours the mass is reduced to 157 gm. if the specific gravity of grains is 2.68, calculate the moisture content, void ratio and degree of saturation.   (6)
iii) A series of tests on a soil sample of silty clay indicated the following index. D_{60}= 0.0050mm, D_{10} = 0.0007mm, LL=53.9%, PL=23.4%, w=51.2%. Calculate the coefficient of uniformity and liquidity index.   (2)

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 Permeability? Describe the laboratory measurement of permeability of soil sample using the Darcy's principle on coarse grained 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/m^3. 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/m^3.   (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. (6)

ii) A falling head permeameter test, head causing flow was 50 cm and drop 2 cm in 5 min. How much time is required for the head to fall 25 cm? (5)

iii) What is flownet? Mention the properties of flownet. (5)

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/m^2, frictional angle=30°. Use Terzaghi equation Nc=37.2, Nq=22.5 and Nγ=19.7. (6)

or

b i) Write the Terzaghi's assumptions, analysis, expressions, and limitation for ultimate bearing capacity of soil. (10)

(ii). Design a strip footing to carry a load of 750 KN/m at a depth of 1.6 m in a frictional cohesive soil having a unit weight of 18 KN/m^3 and the shear strength parameters cohesion is 20 KN/m^2 and angle of internal friction is 25°. Determine the width of footing using a factor of safety of 3 against shear failure. Use Terzaghi's equation Nc=25.1, Nq=12.7 and Nγ=9.7. (6)

15. a i) Describe briefly the types of soils found in Tamil Nadu. (11)

ii) With the help of a diagram describe the soil profile. (5)

or

b. 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. (16)