B.E. / B.Tech. (Full Time) Arrear EXAMINATIONS, NOV / DEC 2012

AGRICULTURAL AND IRRIGATION ENGINEERING BRANCH

FOURTH SEMESTER – (REGULATIONS 2008)

AI 9251 – SOIL SCIENCE AND ENGINEERING

Time: 3 hrs   Max Marks: 100

Answer ALL Questions

Part – A (10 x 2 = 20 Marks)

1) Draw a sketch to indicate the percentage volume composition of a loamy soil when in good condition for plant growth.

2) Compare the activity of H^+ ion concentration in a soil at pH 4 with that in a soil at pH 6.

3) A soil sample has void ration 0.667. The specific gravity of solids is 2.70. Calculate the porosity and dry density.

4) A 120g freshly drawn soil sample weighs 109.25g on oven drying at 105°C. Calculate the soil water content on weight and volume basis when the bulk density of soil is 1.52 g/cc.

5) Define permeability and list the factors affecting the same.

6) What are the assumptions of Rankine's theory to calculate the active earth pressure?

7) Differentiate infinite and finite slopes with examples.

8) Draw neat sketches of different types of spread footing.

9) What are base maps and where are they used?

10) List the mail soil problems in Tamil Nadu and the places where they occur.

Part – B (5 x 16 = 80 Marks)

11) a) i) Discuss in detail the 4 major components of mineral soils and their importance.   (10)

    ii) What are soil colloids? Explain the ion exchange process in detail.   (6)

12) a) i) Discuss the Atterberg's limits of consistency with neat sketch and also explain the laboratory methods to determine the same.   (16)

(or)

b) i) A cube of dried clay having sides 4 cm long has a mass of 110 g. The same cube of soil when saturated at unchanged volume has a mass of 135 g. Draw the soil element showing the volumes and weights of the constituents and find out the specific gravity of soil solids and void ratio.   (8)

ii) Explain the field compaction theory and explain the laboratory and field studies to determine the same. (8)

13) a) i) State Darcy's law and discuss the factors affecting permeability. (8)

ii) In a falling head permeameter test, the initial head is 40 cm. The head drops by 5 cm in 10 min. Calculate the time required to run the test for the final head to be at 20 cm. If the area of stand pipe is 0.5 cm^2 and the sample is 6 cm height and 50 cm^2 in cross sectional area, calculate the coefficient of permeability. (8)

(or)

b) i) What are flow nets and their applications? Discuss the method of determining the seepage through flow nets. (8)

ii) A specimen of clean, dry, cohesion less sand is tested in shear box and the soil failed at a shear stress of 40 kN/m^2 when the normal load on the specimen was 50 kN/m^2. Determine the angle of shearing resistance, the principal stress during the failure, the direction of the principal planes with respect to the direction of plane of shearing. (8)

14) a) i) How will you analyse the failure of complete bearing capacity? Write the assumptions, expressions and limitations in analysing the same. (8)

ii) Discuss the types of failure of finite slope in detail. (8)

(or)

b) i) Explain with neat sketches the different types of shallow foundation. (8)

ii) A square footing 2 m x 2 m is built in a homogenous bed of sand of unit weight 20 kN/m^3 and having an angle of shearing resistance of 35°. The depth of the base footing is 1.25 m below the ground surface. Calculate the safe load that can be carried by a footing with a factor of safety of 3 against complete shear failure. Use Terzaghi's analysis. (8)

15) a) i) Discuss the taxonomical classification of a soil type with an example. (8)

ii) Explain how survey reports are prepared. (8)

(or)

b) i) Explain in detail the Land Use Capability classification. (8)

ii) Discuss the reclamation of problem soils in detail (8)