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B.E/B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2013

(18)

AGRICULTURAL AND IRRIGATION ENGINEERING BRANCH

FOURTH SEMESTER – (REGULATIONS 2008)

AI 9251 – SOIL SCIENCE AND ENGINEERING

Time : 3 hours.

Max Marks: 100

Instructions: Draw neat sketches wherever needed

Answer ALL Questions

Part – A (10 x 2 = 20 Marks)

1. Explain the munsell soil colour chart?
2. What make the colour of soil Red, Black and White? Give reasons.
3. Why is soil Mechanics important for a Civil Engineers?
4. A sample of saturated clay has water content as 47% and specific gravity as 2.7. Calculate the void ratio e , the porosity n and the saturated unit weight γ_{sat} .
6. Differentiate between standard and modified proctor test any 5 points
7. Using Rankin's formula, find the minimum depth of foundation of a square footing 2mx2m of a column carrying a load of 40 tons. The foundation consists of sandy soil weighing 2.85 tons with a shear angle of 35° .
8. What are different types of slope failures?
9. What are the types and method of soil survey?
10. Write the characteristics of land belonging to class I irritability classes

Part – B (5 x 16 = 80 Marks)

11.
 - i) Describe briefly the influence of soil reaction on major and minor nutrients availability to the plants? (14)
 - ii) A soil core was drawn with a core cutter having an inside diameter of 6.2 cm and height 16 cm from a field two days after irrigation when the soil when the soil water was near field capacity. The weight of the core cutter with fresh soil sample was 48.65 gm and the weight of the same on oven drying was 34.78 gm. If the particle density of soil is given as 2.68 g/cm^3 . The empty core cutter weighted 1.40 Kg. Calculate the (a) bulk density (b) Porosity of soil (2)
 12. a What is the purpose of soil classification? Explain how soils are classified according to Highway Research Board and Unified soil classification system. Describe briefly any three types of field compaction and instruments? (16)
- OR**
- b
 - i) What is optimum moisture content? Explain with neat sketch the standard proctor compaction test to determine the density of soil. (12)
 - ii) Soil sample has a porosity of 40%, specific gravity of soil is 2.70. Calculate the void ratio, dry density, unit weight if the soil is 50% saturated and unit weight is completely saturated. Take the unit weight of water as 9.81 (4)
 - iii) Differentiate between plastic limit and shrinkage limit. (2)

13. a i) State Darcy's law and define coefficient of permeability. Explain with a neat diagram, a method for determining coefficient of permeability of cohesive soil in the laboratory. (12)

ii) A pumping test was made in a pervious soil extending to a depth of 18 m, where a bed of clay was encountered. The normal groundwater level was 1 m below the ground level. Observation wells were located at distance of 4 m and 8 m from the pumping well. At a discharge of 9 cu.m. per minute from the pumping well, a steady state was attained in 24 hours. The drawdown at 4 m was 2 m and at 8 m was 0.5 m. Calculate the coefficient of permeability in cm/sec. (4)

OR

b i) What is permeability? Explain how you can measure the permeability in the field? (12)

ii) A sample in a variable head permeameter is 10 cm in diameter and 12 cm height. The permeability of the sample is estimated to be 10×10^{-4} cm/sec. If it is desired that the head in the stand pipe should fall from 24 cm to 11 cm in 4 min, determine the size of the stand pipe which should be used. (4)

14. a i) Describe briefly with the help of a sketch, how you will conduct a load test to ascertain the bearing capacity of a soil. (10)

ii) A square footing is located at a depth of 1.5 m below the ground has to carry a safe load of 900 KN. Find the size of footing if the factor of safety is 3. The soil has the following properties such as void ratio as 0.55, degree of saturation as 50%, specific gravity of soil as 2.67, Cohesion as 8 KN/m² and frictional angle is 30°, unit weight of water as 9.81. Use the Terzaghi analysis $N_c = 37.20$, $N_q = 22.50$, $N_\gamma = 19.70$. (6)

OR

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

ii) A foundation in loose sand is 4m wide, 6m long and 1.5 m deep. The soil weighs 16 KN/m³ and has an angle of internal friction 32°. Compute the safe bearing capacity, adopting a factor of safety of 2. (2)

iii) Briefly explain any 4 types of shallow foundation with a neat sketch. (4)

15. a i) Describe the twelve orders of USDA Soil Taxonomical Classification, and also describe the soil groups in Tamil Nadu (12)

ii) Describe briefly point out the characteristics of alluvium and red soil group, particularly in references to the engineering properties of the available soils. (4)

OR

b. i) Describe briefly on the problems soils of acidic, alkaline and saline soils on reasons, characteristics, injury to crops, amelioration and crops suitable for cultivation. (16)
