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B.E / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATION, NOV / DEC 2013
AGRICULTURAL AND IRRIGATION ENGINEERING BRANCH
III SEMESTER – (REGULATIONS 2012)
AI 8301 – SOIL SCIENCE AND ENGINEERING

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Time : 3 hours.

Max Marks: 100

Answer ALL Questions

Part – A (10 x 2 = 20 Marks)

1. Distinguish between Nitrification and Ammonification.
2. Compare between soil texture and structure.
3. Give the reasons for salinity 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. A soil has a porosity of 0.45. What is the value of its void ratio?
6. Differentiate between well graded and poor graded soil.
7. Distinguish between compaction and consolidation of soil.
8. A cylindrical mould of diameter 7.7 cm contains 15.0 cm long sample of sand. When water flows through the soil under constant head at a rate of 55 cc/minute, the loss of head between two points 8 cm apart is found to be 12.5 cm. Calculate the coefficient of permeability of the soil.
9. Write the factors affecting bearing capacity of soil.
10. Under what conditions raft and grillage foundations are constructed?

Part – B (5 x 16 = 80 Marks)

11. i) Explain the influence of soil reaction of availability of nitrogen, phosphorus and potassium in plant growth? (10)
 ii) Compare between organic and fertilizers that are used by the farmers. (6)
12. a) i) Name all the orders of USDA Soil Taxonomical Classification, briefly describe the 10 orders most important among the orders found in India. (16)
 OR
 b) i) Describe the Alluvium, Red, Black, laterite 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)
13. a) i) Describe briefly three types of field compaction and explain the HRB, USC and classification of black cotton soils of India. (16)
 OR
 b) i) Briefly describe the procedure to determine liquid limit of a soil. (7)
 ii) The following index properties were determined for two soils A and B (5)

Index Properties	Soil A	Soil B
Liquid limit	65	35
Plastic Limit	25	20
Water content	35	25
Specific gravity	2.70	2.65
Degree of Saturation	100%	60%

which of the two soils contains more clay particles and also find the bulk density, dry density, void ratio. Assume the density of water as 1.

iii) From the particle size distribution curve of sandy soil, the data obtained (4)

Particle finer	Grain size in mm
10	0.050
30	0.20
60	0.40

Calculate the coefficient of curvature and coefficient of uniformity, is the soil is well graded or poor graded.

14. a i) State Darcy's law and define coefficient of permeability. Describe the field measurement of permeability of soil using the tracer method with a sketch. (10)
 ii) A soil sample of 20 mm thick takes 20 minutes to reach 20% consolidation. Find the time taken for a clayey layer 6 m thick to reach 40% consolidation. Assume the double drainage in both cases. (6)

OR

- b. i) In a falling head permeameter test, head causing flow was initially 50 cm and it drops 2 cm in 5 minutes. How much time required for the head to fall to 25 cm? (5)
 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) In the laboratory a 2 cm thick soil sample takes 25 minutes to reach 30% degree of consolidation. Find the time taken for a 5 m thick clay layer in field to reach a 40% consolidation. Assume double drainage in both the case. (6)

15. a i) Write the Terzaghi's analysis, expressions, assumptions and limitation for ultimate bearing capacity of soil with a neat sketch. (10)
 ii) A square footing is located at a depth of 1.4 m below the ground level has a safe load of 900 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 $N_c=37.2$, $N_q=22.5$ and $N_\gamma=19.7$. (6)

OR

- b i) Briefly describe the Plate load test to determine the bearing capacity of soil. Write the advantage and disadvantage of plate load test. (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 $N_c=25.1$, $N_q=12.7$ and $N_\gamma=9.7$. (6)