

AGS

INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

Date: xx/09/15

Time: 2 Hrs

Full Marks: 30

No. of Students: 51

Autumn Semester

Deptt: Agricultural and Food Engineering

Sub No. AG20103

2nd Yr. B. Tech. (Hons.)

Sub. Name: Soil Technology

1. Define saline and alkaline soil. Explain how does salinity and alkalinity affect the crop and soil productivity. Suggest alternative methods for the reclamation of these soils. (5)
2. What are the possible reasons for soils to become acid and how does it affect the crop productivity. Write briefly, the alternatives management of acid soils. (5)
3. Explain briefly various factors responsible for low food grain production in India. (5)
4. Differentiate between the following: (5)
 - a. Soil formations under high vs. low rainfall conditions
 - b. Aggregate size distributions in soils with high vs. low soil organic carbon contents
 - c. Soil water contents at field capacity vs. wilting point
 - d. Plant available water contents in sandy vs. loam soils
 - e. Tetrahedral layer vs. octahedral layer in silicate clays
 - f. Air-filled porosity vs. void ratio
5. What do you mean by field water balance in soil. If you are given a time domain reflectometer, which component of the field water balance you can directly measure? (3)
6. What is a water retention curve? How is it linked with pore size and potential head distribution functions. Plot a typical water retention curve (only show schematic and no graph paper is needed) and show field capacity and wilting points in this curve. (3)
7. The following data sets were obtained from dry sieving of two soils A and B: (3)

Aggregate diameter (mm)	Mass of oven dry soil in size class (g)	
	Soil A	Soil B
1.18	9.30	11.3
0.3	47.90	29
0.2	13.60	11
0.18	4.40	4.9
0.125	11.20	19.1
0.09	3.10	4.1
0.075	3.30	8.3
0.053	4.40	8.80
0.005	2.80	3.5

The bulk densities for Soil A and Soil B were 1.5 and 1.4 g/cm³, respectively. The particle density for both the soils were 2.66 g/cm³. Estimate mass fractions for each size (diameter) class of soil aggregates for both the soils. Assuming that soil aggregates are spherical and have the uniform diameter within each size classes, estimate the total number of soil aggregates present in each soil. Estimate the geometric mean diameter for these soils. What conclusion one may make on soil structure based on aggregate size distributions in these two soils.

(6)