The Open University of Sri Lanka
Faculty of Engineering Technology
Bachelor of Industrial Studies Honors (Agriculture)
Final Examination- 2020/2021

AGX5565/AGX5532 Soil Plant Water relationship

Date : 01-02-2022
Time : 9.30-12.30

SECTION II -Answer any four (04) questions

1. (a) Describe the factors influencing soil-forming processes and Soil development.
   (b) Discuss the factors affecting Nitrogen cycle
   (c) Explain how C/N ratio affects the decomposition of organic matter added to the soil.

2. (a) Discuss the importance of the use of organic fertilizer over inorganic fertilizer.

   (b) Describe the basic rules that are needed to produce good quality compost.

3. (a) Briefly explain the composition of soil air and the factors affecting the soil aeration.

   (b) Consider a soil profile in which the air-phase oxygen concentration diminishes linearly from 21% at the soil surface to half of that at 100cm depth. If the total porosity is a uniform 45% and the volume wetness is 35% calculate the diffusion rate using Penman's coefficient for the effective diffusion coefficient of oxygen in the soil (Ds). Assume steady –state diffusion. Use a value of 1.89×10^{-1} cm^2/sec for the bulk-air diffusion coefficient. Tortuosity factor is 0.66 (assumed by Penman to be constant).

4. (a) Explain using a diagram and Derive the equation for the steady state downward percolation of water.

(b) Consider two cases of steady downward percolation through a two layered soil profile, the top of which is submerged under a 1m head of water and the bottom of which is defined by a water table. Each of the two layers is 50 cm thick. In the one case, the conductivity of the top layer is 10^{-4} cm/sec and that of the sub layer is 10^{-5} cm/sec. In the second case, the same layers are reversed (i.e. the less conducive soil overlies the more conductive). Calculate the flux, and the hydraulic and pressure heads at the interface between the layers, for each of the cases.

(5) (a) Briefly explain the thermal regime in soils using suitable diagram.

(b) Calculate the volumetric heat capacity of a soil with a bulk density of 1.50 g/cm^3 when completely dry, when completely saturated. Assume that the density of solids is 2.65 g / cm^3 and that organic matter occupies 15% of the solid matter (by volume).

(6) (a) Briefly explain the term " Effective Rainfall"
(b) What is meant by Gross Irrigation Requirement?
(c) A stream of 140 litres per second was diverted from a canal and 100 litres per second were delivered to the field. An area of 1.6 hectares was irrigated in eight hours. The effective depth of root zone was 1.8m. The runoff loss in the field was 432 cum. The depth of water penetration varied linearly from 1.8m at the head end of the field to 1.2 m at the tail end. Available moisture holding capacity of the soil is 20cm per metre depth of soil. Irrigation was started at a moisture extraction level of 50 percent. Calculate the following:
(i) Water conveyance efficiency
(ii) Water application efficiency
(iii)Water storage efficiency
(iv)Water distribution efficiency

End of the paper