

THE OPEN UNIVERSITY OF SRI LANKA
Faculty of Engineering Technology
Department of Agricultural & Plantation Engineering



Bachelor of Industrial Studies Honours (Agriculture)

Final Examination (2016/2017)
AEX5232: Soil Plant Water Relations

Date: 16th November 2017 (Thursday)

Time: 9:30 am – 12:30 pm

Index Number:

Instructions

Section 02 – Answer any four (04) out of the six (06) questions. You may use answer books and/or sheets to answer this section.

- Q1.** a) Soil aeration plays an important role in plant growth. Describe how you can improve the soil aeration in an agricultural field.
b) Briefly explain the importance of soil temperature on plant growth.
- Q2.** 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.
- Q3.** (a) Briefly explain the term “Effective Rainfall“
(b) What is meant by Gross Irrigation Requirement?
(c) A stream of 140 liters per second was diverted from a canal and 100 liters 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 meter depth of soil. Irrigation was started at a moisture extraction level of 50 per cent of the available moisture. Determine the following
- (i) Water conveyance efficiency
 - (ii) Water application efficiency
 - (iii) Water storage efficiency
 - (iv) Water distribution efficiency

Q4. 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.

Q5. (a) Briefly explain the volume fraction of soil air and its importance on Agriculture.

(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 (D_s). Assume steady-state diffusion. Use a value of $1.89 \times 10^{-1} \text{ cm}^2/\text{sec}$ for the bulk-air diffusion coefficient. Tortuosity factor is 0.66 (assumed by Penman to be constant).

Q6.(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).

END OF PAPER