



The Open University of Sri Lanka  
 Faculty of Engineering Technology  
 Diploma/Degree in Technology (Agricultural Engineering) and  
 Industrial Studies (Agriculture)

Final Examination- 2013/2014

**AEX5232 Soil Plant Water relationship**

Date : 13/08/2014

Time : 9.30-12.30

**SECTION II -Answer any four (04) questions**

- (1) (a) Briefly explain the major pore types in soil and their role in holding the water in Sandy Loam and Silty Clay textural classes of soil.
- (b) Discuss the factors influencing the rate of infiltration in an agricultural land.
- (2) a) Sketch and Derive the equation for water flux for downward flow of water in a vertical soil column.
- (b) Consider a case of steady downward percolation through a single 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. The thickness of the soil. layer is 150 cm and the conductivity is  $10^{-6}$  cm/sec. Calculate the flux and comment on the suitability of this soil for agricultural purposes.
- (3). (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).

- (4) Write an essay on the effect of water deficit on plant growth and physiological processes of the plant.
- (5) .(a) State the effects of soil salinity on crop growth and crop production.  
(b) Explain how soil salinity can be reduced to have good plant growth.
- (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 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