MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2012/2013

FIRST YEAR SECOND SEMESTER EXAMINATIONS FOR THE DEGREE OF MASTER OF SCIENCE IN HORTICULTURE

SHC 822: SOIL WATER NUTRIENT RELATIONS

Date: 22nd July, 2013   *Time: 9.00 – 12.00 noon*

SHC 822: SOIL-WATER NUTRIENT RELATIONS

DATE: ...?   TIME: ?

INSTRUCTIONS:
This paper comprises sections A and B.
Answer ALL questions in section A and any TWO questions in section B.

SECTION A:
Answer ALL questions in this section. Each question carries 10 marks.

QUESTION 1
Distinguish between the following:
- (a)   Appoplasm and symplasm
- (b)   Capillary water and hygroscopic water
- (c)   Immobilization and fixation of plant nutrient elements
- (d)   Water free space and Donnan free space
- (e)   CEC in soil and CEC in plant roots

QUESTION 2
Outline the following:
- (a)   The factors that influence water infiltration into the soil
- (b)   The steps you would follow in determining volumetric water content of a soil sample

SECTION B:
Answer any TWO questions in this section. Each question carries 20 marks.

QUESTION 3
Discuss the relationship between soil-water and nutrition of terrestrial plants

QUESTION 4
Discuss plant nutrient movement from soil colloid to the surface of plant root

QUESTION 5
Discuss land/soil degradation caused by water and how such land/soils may be reclaimed.

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SHC 824: SOIL PHYSICS AND CROP IRRIGATION

Date: 26th July, 2013   Time: 8.30 – 11.30 a.m.

SHC 824: SOIL PHYSICS AND CROP IRRIGATION

DATE: ...????...   TIME: ????

INSTRUCTIONS:

This paper comprises sections A and B.
Answer ALL questions in section A and any THREE questions in section B.

SECTION A (40 Marks): Answer ALL questions in this section.

QUESTION 1: Explain briefly how the following characteristics affect soil water relations

    (a)   Soil texture
    (b)   Soil bulk density
    (c)   Soil texture
    (d)   Soil depth   (8 Marks)

QUESTION 2:

Explain the polyphasic nature of soil with respect to water availability and plant gowth.
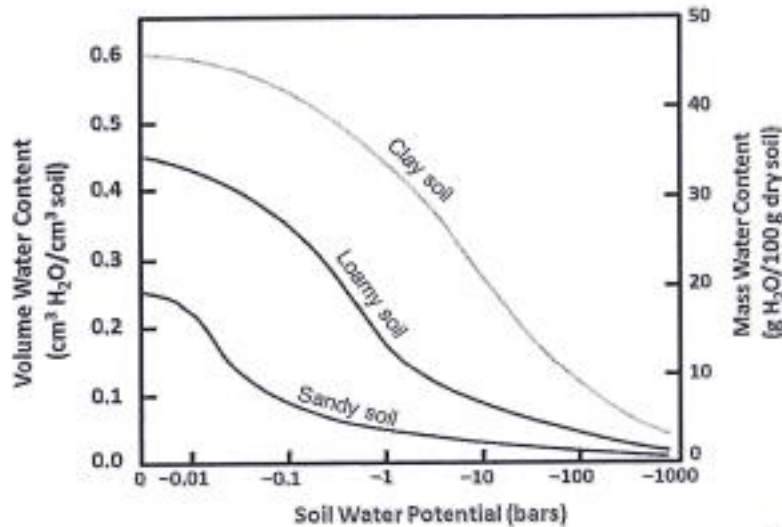
    (4 Marks)

QUESTION 3.

Calculate the bulk density and soil porosity from the following data: Fresh weight of soil = 2500 grams; Weight of water = 750g; Height of core = 10cm and Diameter of the core = 12cm; particle density = 2.65 gcm^{-3}.

    (5 Marks)

QUESTION 4.

Briefly explain the concept of soil moisture characteristic curve by looking at the following figure.

Soil Water Potential (bars)

(5 Marks)

QUESTION 5.

Explain the term basic infiltration rate and why it is important in the design of sprinkler irrigation system. Why would the value of the basic infiltration rate for sandy soil be very different from that of a clay soil and what would be the implication for sprinkler precipitation rate design?

(10 Marks)

QUESTION 6.

Explain the concept of hydraulic conductivity. Distinguish between saturated and unsaturated flows within a soil and the factors which would be important in determination of water movement in each case. (8 Marks)

SECTION B: Answer any THREE questions in this section. Each question carries 10 marks.

QUESTION 7

a) Discuss the physical classification of soil water and how it is important in understanding water availability to plant within the soil.

b) A soil has an average soil moisture content of 36.5% at field capacity and 13.5 % at

permanent wilting point on dry weight basis. The bulk density of the soil is 1.6g cm-3. Find out the available soil per meter depth of soil profile.

(10 Marks)

QUESTION 8
Discuss the gravimetric method of soil water measurement indicating the kind of equipement you would need to determine water content by weight and volume.
(10 Marks)

QUESTION 9
Discuss the problems of soil salinity and sodicity and explain how such soils can be reclaimed and managed under irrigation production.   (10 Marks)

QUESTION 10
Discuss the concept of the soil water balance indicating how the components can be measured and used to determine both the inputs and outputs into the system during a crop production season.   (10 Marks)