EGERTON UNIVERSITY

UNIVERSITY EXAMINATIONS

NJORO CAMPUS

SECOND SEMESTER 2012/2013

FOURTH YEAR EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN WATER AND ENVIRONMENTAL ENGINEERING

AGEN 455: IRRIGATION AND DRAINAGE ENGINEERING I

STREAM: 2008 (Y5) B. SC. WEEN   **TIME:** 2 hours

DAY/TIME: MONDAY, 08.30 – 11.30 am   **DATE:** 27-05-2013

INSTRUCTIONS:

1. The paper contains **FOUR (4)** questions.
2. Attempt **QUESTION ONE** and **any other TWO (2)**
3. All questions carry equal marks.
4. Show all workings for each question
5. Carefully read the instructions on the answer booklet
6. **EACH QUESTION SHOULD BE STARTED ON A NEW PAGE.**

QUESTION ONE (30 marks) - COMPULSORY

(a) Briefly describe the following components of Irrigation Water Management:

    (i)   Conveyance system management.

    (ii)   Land Management

    (iii) Rain water Management

    (iv) Conjunctive use of water

    (v)   Sodium salts in irrigation water   **(10 marks)**

(b) After how many days will a farmer supply water to soil in order to ensure sufficient irrigation of the given crop, if field capacity of the soil = 30%, permanent wilting point = 12%, density of soil = 1.25 gm/cm^3, effective depth of root zone = 60 cm, and daily

consumptive use of water for the given crop = 12.5 mm. Assume the readily available moisture is 80% of the available moisture. **(10 marks)**

(c) A sprinkler system is designed for day time irrigation in a temperate climate where winds are moderate. The system design efficiency is estimated as 70%. The crop is cotton and its net water requirement (NWR) is 75 mm. Determine:

    (i)   The additional amount of water applied in excess of net water requirement (NWR) **(2 marks)**

    (ii)   The duration of irrigation, assuming the water is applied at a rate of 7.2 mm/hr **(2 marks)**

    (iii)   Gross water requirement (GWR) **(2 marks)**

    (iv)   Using a clearly labeled sketch, explain the pattern of moisture absorption from the root zone which the crop roots system develops to derive water for growth. **(4 marks)**

QUESTION TWO (20 marks)

(a) Explain why excessive water application in irrigation is a poor practice. **(3 marks)**

(b) The following information presented in the table below was obtained for a closed-end border irrigation system of length 210 m and 18 m width. Volume of water applied to the boarder was 565 m^3 while irrigation requirement was 110 m.

Distance (m)	0	30	60	90	120	150	180	210
Depth infiltrated (mm)	135	137	138	141	150	164	167	165

Calculate the following:

    (i)   Distribution uniformity

    (ii)   Application efficiency

    (iii)   water requirement efficiency

    (iv)   Deep percolation efficiency. **(8 marks)**

(c) Define the following terms as used in irrigation and drainage engineering:

    (i)   Irrigation period. **(2 marks)**

    (ii)   Superfluous water. **(2 marks)**

    (iii)   Saturation capacity. **(2 marks)**

(d) State **three (3)** important parameters that influence the porosity of a soil. **(3 marks)**

QUESTION THREE (20 marks)

(a) Explain how voids in the soil influence crop production. **(2 marks)**

(b) The Kenya government has embanked on broad government initiatives for enhanced irrigation development. State some of these initiatives. **(7 marks)**

(c) Name and give examples of the classification of drains according to their function. **(5 marks)**

(d) A tile drain system draining 10 ha flows at a design capacity for three days following a storm. If the system is designed using a drainage coefficient of 2.0 cm, how much water will be removed during this period? **(6 marks)**

QUESTION FOUR (20 marks)

(a) Define the following terms:

    (i)   Base period.

    (ii)   Duty.

    (iii)   Irrigation potential.

    (iv)   Threshold salinity. **(8 marks)**

(b) What is the difference between crop water requirement and irrigation water requirement? **(4 marks)**

(c) Determine the uniformity of coefficient for depths of penetration of five points in a field 1.0, 0.75, 0.60, 0.50, and 0.40 m. **(8 marks)**

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