



# THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

*Faculty of Engineering and Technology*

**DEPARTMENT OF BUILDING AND CIVIL ENGINEERING**

**UNIVERSITY EXAMINATIONS FOR BACHELOR OF  
ENGINEERING IN BUILDING & CIVIL ENGINEERING**

ECE 2405 : IRRIGATION ENGINEERING I

**END OF SEMESTER EXAMINATION**

SERIES: AUGUST/SEPTEMBER 2011

**TIME: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- *Answer booklet*

This paper consists of **FIVE** questions in **TWO** sections **A & B**

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

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**SECTION A (COMPULSORY – 30 MARKS)**

**Question 1**

- |   |             |
|---|-------------|
| a) Define the term irrigation                                   | (1 mark)    |
| b) Outline <b>FOUR</b> points that necessitate irrigation needs | (2 marks)   |
| c) Briefly explain what are inundation canals                   | (4 marks)   |
| d) Outline the objectives of canal lining                       | (6 marks)   |
| e) Briefly describe “Cross Drainage Works”                      | (2 marks)   |
| f) Outline <b>THREE</b> types of consumptive use                | (1 ½ marks) |

- g) Define the term “water requirements of a crop” (1 mark)
- h) Define the term Delta (1 mark)
- i) The depths of penetrations along the length of a border strip at points 30 meters apart were proved. Then observed values are 2.0, 1.9, 1.8, 1.6 and 1.5 metres. Calculate the water distribution efficiency (6 marks)
- j) The monthly consumptive use values for Paddy are tabulated below

Dates		Rice (Loam soil) Cu in Cm
June	1 – 30	29.69
July	1 – 12 <span style="border: 1px solid black; padding: 0 2px;">Nursery</span>	8.76
July	13 - 31	14.38
August	1 – 31	22.73
September	1 – 30	21.29
October	1 – 31	25.50
November	1 – 24	15.06

- (i) Calculate the total consumptive use (2 marks)
- (ii) Calculate the average monthly consumptive use (2½ marks)
- (iii) Calculate the peak monthly consumptive use (1 mark)

**SECTION B** (Answer any TWO questions from this section. Each question carries 20 marks)

**Question 2**

A stream of 130 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 8 hours. The effective depth of root zone was 1.7m. The runoff loss in the field was 420m<sup>3</sup>.

The depth of water penetration varied linearly from 1.7m at the head end of the field to 1.1m at the tail end. Available moisture holding capacity of the soil is 20cm per metre depth of soil.

Calculate:

- (i) The water conveyance efficiency (1 mark)
- (ii) Water application efficiency (4 marks)
- (iii) Water storage efficiency (9 marks)
- (iv) Water distribution efficiency (6 marks)

Irrigation was started at a moisture extraction level of 50% of the available moisture.

### Question 3

After how many days will you supply water to soil in order to ensure sufficient irrigation of the given crop, if;

- (i) Field capacity of the soil = 28%
- (ii) Permanent wilting point = 13%
- (iii) Density of soil = 1.3gm/cc
- (iv) Effective depth of root zone = 70cm
- (v) Daily consumptive use of water for the given crop = 12 mm

Assume any other data not given

(20 marks)

### Question 4

The culturable commanded area for a distributary is 15,000 hectares. The intensity of irrigation (1.1) for wheat is 40% and for rice is 15%. If the total water requirements of the two crops are 37.5cm and 120cm and their periods of growth are 160 days and 140 days respectively.

- a) Calculate the outlet discharge from average demand considerations (8 marks)
- b) Calculate the peak demand discharge assuming that the water depth for two crops are 13.6cm and 19cm and their periods are 4 weeks and 2 weeks respectively (12 marks)

### Question 5

- a) Define the term water requirement for crops (2 marks)
- b) Represent the water requirement mathematically (2 marks)
- c) State the factors affecting the water requirement (10 marks)
- d) Define the term consumptive use of water (1 mark)
- e) Express the same mathematically (1/2 mark)
- f) What range is it said that the soil is acidic (1/2 mark)
- g) How does soil compaction destroy the quality of soil (1 mark)
- h) The left branch canal carrying a discharge of  $20\text{m}^3/\text{s}$  has culturable commanded area of 20,000 hectares

The intensity of crop is 80% and the base period is 120 days. The right branch canal carrying a discharge of  $8\text{m}^3/\text{s}$  has culturable commanded area of 12,000 hectares. Intensity of irrigation of crop is 50% and the base period is 120 days. Compare the efficiencies of the two canals.

(3 marks)