



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV 4416 : IRRIGATION ENGINEERING

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: JULY 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of five questions.

Attempt question ONE (Compulsory) and any other TWO questions

Do not write on the question paper.

QUESTION ONE - COMPULSORY

- a) Explain the following terms;
- i. Duty
 - ii. Delta
 - iii. Net irrigation requirement
 - iv. Hydroscopic water
- b) State six adverse effects of irrigation to the environment.
- (4 marks)
(6 marks)

- c) Sketch a phase diagram to show, gravitation water, capillary water and hygroscopic water (6 marks)
- d) If rice requires about 10cm depth of water at an average interval of about 10 days and the crop period for rice is 120 days, Find the depth of water. (4 marks)
- e) Determine the evaporation and net irrigation requirements for wheat. Use Blane Criddle equation. Crop factor for the growing season is 0.8. Use the following data. (10 marks)

Month	Mean Monthly Temp. ($^{\circ}\text{C}$) (t)	Monthly % of sunshine hours (p)	Effective rainfall (cm)
Nov	18	7.2	2.6
Dec	15	7.15	2.8
Jan	13.5	7.30	3.50
Feb	14.5	7.10	2.00

QUESTION TWO

- a) Explain then procedure of using a lysimeter. (10 marks)
- b) State four factors affecting duty. (4 marks)
- c) Outline six methods of improving duty in irrigation activities. (6 marks)

QUESTION THREE

- a) Use a sketch to explain the efficiency of irrigation (8 marks)
- b) After how many days will one supply water to soil in order to ensure sufficient irrigation of a given crop if;
- Field capacity of soil = 28%
 - Permanent wilting point = 13%
 - Dry density of soil is 1.3gm/cc
 - Effective depth of root zone 70cm
 - Daily consumptive use of water for the given crop =12mm (8 marks)
- c) State four factors affecting consumptive use of water which may affect irrigation (4 marks)

QUESTION FOUR

- a) Irrigation water provided to a crop in the field to bring the moisture content of soil from the existing 18% to the field capacity of the soil at 28%. The effective root zone of the crop is 70cm. If the density of the soil and water in are $1.3\text{gm}/\text{cm}^3$ and $1.0\text{gm}/\text{cm}^3$ respectively, find the depth of irrigation water in (mm) for irrigating the crop. (8 marks)
- b) Watering period for rice is 10 days and it requires 60cm of water. Effective rainfall is 10cm per day. Find the area of land that is irrigated with $1\text{m}^3/\text{sec}$. (4 marks)
- c) Outline the following terms;
- Effective irrigation operation
 - Efficiency of conveyance of irrigation
 - Soil moisture efficiency

- iv. Field capacity (4 marks)
d) Advantages of irrigating in arid and semi-arid lands (4 marks)

QUESTION FIVE

- a) Ground water is one of the sources of irrigation water. Explain then procedure of drilling water using rotary drilling method. (10 marks)
b) Using Hargreave class A evaporation pan and the table below, determine Net irrigation required. (10 marks)

Period of growth	CU=k.Ep
Oct	3.74
Nov	8.41
Dec	15.59
Jan	18.9
Feb	1.12