



TECHNICAL UNIVERSITY OF MOMBASA
**Faculty of Engineering &
Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING
**UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING
(BSCE – Y4, S1)**

ECE 2405: IRRIGATION ENGINEERING I

**END OF SEMESTER EXAMINATION
SERIES: APRIL 2014
TIME ALLOWED: 2 HOURS**

Instructions to Candidates:

You should have the following for this examination

- *Answer booklet*

This paper consists of **FIVE** questions.

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

All questions carry equal marks

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One

- a) Outline the **FOUR** phases of irrigation engineering. **(4 marks)**
- b) Outline the **FOUR** governing factors for the necessity of irrigation. **(4 marks)**
- c) Describe in detail how to classify canals based on the nature of source of supply of water **(11 marks)**
- d) Describe in greater detail the types of lining in irrigation canals **(3 marks)**
- e) Outline **THREE** advantages and **THREE** disadvantages of canal lining. **(6 marks)**

- f) A crop requires a total depth of 92cm of water for a base period of a 120 days. Calculate the duty of water. **(2 marks)**

Question Two

- a) (i) Explain the term “Betterment levy basis” in irrigation engineering. **(3 marks)**
- (ii) In what context is the term used in irrigation engineering. **(2 marks)**
- b) The command area of channel is 4000 hectares. The intensity of irrigation of a crop is 70%. The crop requires 60cm of water in 15 days, when the effective rainfall is recorded as 15cm during that period. Calculate:
- (i) The duty at the head of field
- (ii) The head discharge at the head of channel
- (iii) The duty at the head of channel

Assume total losses at 15% **(15 marks)**

Question Three

- a) Describe the methods of Application of water in irrigation fields. **(10 marks)**
- b) (i) Estimate the mean velocity of flow and
- (ii) Carrying capacity of a lined canal water course, rectangular in section with a bottom width of 50cm and depth of flow of 25cm (inside)

Single layer bricks are laid in cement mortar with a cement plaster 8mm thick. The slope of the channel bed is 2m per kilometer manning's $n = 0.015$ **(10 marks)**

Question Four

- a) Describe the 3 types of consumptions use. **(6 marks)**
- b) A stream of 135 litres per second was diverted from a canal and 100litres per second were delivered to the field. An area of 1.6ha was irrigated in 8 hours. The effective depth of root zone was 1.8m. The runoff loss in the field was 432m^3 . The depth of water penetration varied line only from 1.8m at the head end of the field to 1.2m at the tail end. Available moisture holding capacity of the sol is 20cm per metre depth of soil. Calculate:
- (i) Water conveyance efficiency **(2 marks)**
- (ii) Water application efficiency **(2 marks)**
- (iii) Water storage efficiency **(3 marks)**
- (iv) Water distribution efficiency **(6 marks)**

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

Question Five

- a) Describe the 3 phase system of soils **(8 marks)**
- b) Define:
- (i) Intensity of irrigation **(1 ½ marks)**
 - (ii) The term “Field Capacity” **(1 ½ marks)**
 - (iii) The term “Duty” **(1 mark)**
- c) Determine the head discharge of a canal from the following data. The value of time factor may be assumed as 0.75.

Crop	Base Period in Days	Area in Ha	Duty in Ha/Cu
Rice	120	4000	1500
Wheat	120	3500	2000
Sugar cane	310	3000	1200

(8 marks)