



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2405 : IRRIGATION ENGINEERING

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE: 15 Dec 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

-Drawing instruments.

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 – 30 Marks)

(a) Define the following parameters

(i) Irrigation

(2 Marks)

(ii) Field capacity

(2 Marks)

(iii) Permanent wilting point

(2

Marks)

(iv) Available moisture content

(2

Marks)

(b) Outline the objectives of canal lining

(4

Marks)

(c) Describe the most problems that result from using poor quality irrigation water.

(6 Marks)

(d) Assume an earth canal on a grade of 0.1%; depth of water 40cm, and side slopes $\frac{1}{2}$ to 1.

Calculate

(i) Velocity of flow

(6 Marks)

(ii) Carrying capacity of the channel; Manning n is 0.025.

(6

Marks)

Question Two (20 Marks)

(a) Outline the types of irrigation highlighting their advantages and disadvantages.

(6 Marks)

(b) Describe why assessment of water is needed in irrigation systems.

(4

Marks)

(c) Outline the disadvantages and ill-effects of irrigation.

(5

Marks)

(d) Briefly discuss how sustainable irrigation can be achieved

(5

Marks)

Question Three (20 Marks)

(a) Discuss deficit irrigation in relation to the arid and semi arid lands in Kenya. (4 Marks)

(b) Define the following terms

(i) Conveyance efficiency
(1 Mark)

(ii) Field canal efficiency
(1 Mark)

(iii) Field application efficiency
(1 Mark)

(iv) Overall irrigation efficiency (1 Mark)

(c) Discuss the criteria for selection of a surface irrigation system (4 Marks)

(d) A small holder irrigation project in Mtwapa has an area of 6Ha. The reference evapotranspiration (ETo) is estimated at 5.5mm/day and the crop factor for horticultural crops $Kc = 0.9$. Number of hours of irrigation per day (HPD) = 8hours.

The conveyance efficiency, field canal efficiency and field application efficiency are 85%, 80% and 82% respectively.

Calculate the required scheme design flow. (8 Marks)

Question Four (20 Marks)

(a) 80% of the irrigation potential in Kenya has not yet been developed. What strategies must be put in place to realize this goal? (6 Marks)

(b) Briefly discuss how irrigation efficiencies can be improved or increased in the farm. (4 Marks)

(c) The net peak water requirement for a scheme is 6mm/day. The available moisture content for the clay loam is 130mm/m and the depletion is allowed up to and around 46%. The root zone is 0.70m. After how many days should irrigation take place to replenish the soil moisture?

(10 Marks)

Question Five (20 Marks)

(a) Briefly discuss the importance of drainage in irrigation scheme. (4 Marks)

(b) Irrigation water is to be pumped from a river through a pipe system to the command point of the farm. The flow rate is 13.3l/s. Assume an allowable velocity of 1.5m/s. Calculate the required diameter of the pipe required. (8 Marks)

(c) Briefly discuss different structures used in an irrigation system (4 Marks)

(d) Briefly compare gravity fed and pump fed irrigation systems. (4 Marks)