TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2413 : IRRIGATION ENGINEERING II

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: SEPTEMBER 2018

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)   [30 marks]

a) Differentiate the following classification of sprinkler irrigation system:
    i.   Portable and semi portable systems.
    ii.   Permanent and semi-permanent system.

[8 marks]

b) With the aid of a sketch explain the following types of sprinkler irrigation system:
    i.   Fixed nozzle sprinkler system.
    ii.   Perforated pipe sprinkler system.
    iii.   Rotating sprinkler system.

[9 marks]

c) Describe a wetting pattern for a single sprinkler.

[3 marks]

d) Determine the required capacity of a sprinkler system to apply water at the rate of 1.75 cm/hour. Three 260 metres long sprinkler lines are required. Twenty two sprinklers are spaced at 17 metre intervals on each line. The spacing between lines is 25.2 metres.

Allowing 1.75 hours for moving each 260 metre sprinkler line, how many hours would be required to apply 7 cm irrigation to a square 22 hectare field? How many days are required assuming 9-hour days?

[10 marks]

ANSWER ANY TWO QUESTIONS

QUESTION TWO   [20 marks]

a)   Discuss the factors considered when choosing an irrigation method.

[5marks]

b)   Explain the importance of land preparation before applying irrigation water.

[4marks]

c)   Discuss the following design consideration of furrow irrigation system
    i.   Width and depth of furrows.
    ii.   Length of furrows.
    iii.   Slope of furrows.

[7 marks]

d)   Discuss factors to be considered when selecting a pump for irrigation.

[4 marks]

QUESTION THREE   [20 marks]

a)   Describe ring basin flooding irrigation method.

[3 marks]

b)   Describe border strip method of irrigation.

[5 marks]

c)   Derive the expression for the time required to cover a given area by border strip method, for a given rate of discharge and the rate of infiltration of water in the soil.

[5 marks]

d)   For border strip method of irrigation, determine the time required to irrigate strip of land of 0.04 hectare in area from the well with a discharge of 0.02 cumecs. The infiltration capacity of the soil may be taken as 5 cm per hour and the average depth of flow on the field as 10 cm. also, determine the maximum area that can be irrigated from this tube wall.

[7 marks]

QUESTION FOUR [20 marks]

a)   With the aid of a sketch describe the arrangement for drip irrigation system and the role of each component.

b)   Discuss sub – surface irrigation methods.

[6 marks]

c)   Discuss the common types of pumps used in irrigation projects in Kenya.

[5 marks]

QUESTION FIVE   [20 marks]

a)   Discuss different types of drainage systems provided in irrigation field to minimize water logging.

[8 marks]

b)   A tile drainage system, draining 15.6 hectares, flows at a design capacity for three days, following a storm. If the system is designed using a drainage coefficient of 1.62 cm, how many cubic meters of water will be removed during this period.

[4 marks]

c)   Determine the size of a circular tile drain, draining 6 hectares of a drainage area, if the drainage coefficient is 1.5 cm and the tile grade is 0.4 per cent. Assume the Manning's coefficient for the tile material as 0.013.

[8 marks]