



MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF AGRIBUSINESS MANAGEMENT AND TRADE

December session EXAMINATION FOR

BACHELOR OF SCIENCE IN AGRIBUSINESS MANAGEMENT

KRM 201: AGRICULTURAL FIELD ENGINEERING

DATE:SCHOOL BASED

TIME: 2 HOURS

INSTRUCTIONS

- Answer question ONE and any other TWO questions.

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) As an irrigation engineer in training, describe the following:
- Irrigation method. (2 marks)
 - Irrigation system. (2 marks)
- b) Explain the following terms:
- Evaporation (2 marks)
 - Irrigation Efficiency (3 marks)
 - Crop growth states (4 marks)
- c) Explain why drainage is important in Kenyan Agriculture (2 marks)
- d) Describe the following components of irrigation water management
- Conveyance system management (2 marks)
 - Land management (2 marks)
 - Rain water (1 mark)
- e) Explain key factors considered when selecting an irrigation system under general circumstances (6 marks)
- f) Explain the following as used in irrigation tech technology
- Return Period (2 marks)
 - Sodium salts problem (2 marks)

QUESTION TWO (20 MARKS)

- a) Explain how you will conduct a double cylinder infiltrometer test (6 marks)
- b) Sketch and label the components of a micro irrigation system for hot pepper production (4 marks)
- c) After how many days will a farmer supply water to soil in order to ensure sufficient irrigation of the given crop, if;
- i. Field capacity of the soil - 30% (2 marks)
 - ii. Permanent wilting point -12% (2 marks)
 - iii. Density of soil – 1.25g/cm^3 (2 marks)
 - iv. Effective depth of root zone – 60 cm (2 marks)
 - v. Daily consumptive use of water for the given crop-12.5mm (2 marks)

Assume the readily available moisture is 80% of the available moisture.

QUESTION THREE (20 MARKS)

- a) A sweet potato farm in Mwea has an irrigation intake pipe diameter of 30cm, with a flow rate of 1.8 m/s. what volume of water will flow through the pipe in 1 hour? (5 marks)
- b) Carrots require 25mm water per irrigation event. The farm has 10 hectares cultivated with sweet potato.
- (i) What volume of water (M^3) will be required for irrigation? (5 marks)
 - (ii) How long will be the irrigation event take (2 marks)
- c) Describe three methods commonly used to irrigate a crop (3 marks)
- d) Explain five environmental effects of irrigated agriculture in a newly introduced scheme. (5 marks)

QUESTION FOUR (20 MARKS)

- a) Explain benefits of irrigation development in Kenya (6 marks)
- b) Explain why it is important to irrigate in the semi-arid parts of Kenya. (6 marks)
- c) Explain factors that affect crop evapotranspiration rate and how actual crop water requirement is estimated at any crop growth stage. (8 marks)

QUESTION FIVE (20 MARKS)

- a) How do reduced pH, conductivity, salinity and total dissolved solids in irrigation water affect plant growth. (10 marks)
- b) A maize crop is grown in an area where peak design root – zone depth is 0.8 m and peak ET_c is 7mm/day. The management allowable deficit (MAD) is 60%, field capacity is 28% (wt. basis), permanent wilting point is 16% (wt. basis), and bulk density is 1.2 g/cc. the area is sprinkler irrigated, with system efficiency estimated at 85%. A period of two days is required for various farm operations. The water is sprinkled at an average rate of 6 mm/hr. Compute the following:
- i. Net irrigation requirement (2 marks)
 - ii. Gross water requirement (2 marks)
 - iii. Minimum irrigation interval (2 marks)
 - iv. Design interval (2 marks)
 - v. Duration of water application (2 marks)