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University Examinations 2013/2014

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF

BACHELOR OF SCIENCE IN HORTICULTURE

ABE 2321 – HORTICULTURAL STRUCTURES

DATE: DECEMBER 2013

TIME: 2HOURS

INSTRUCTIONS: Answer question *one* and any other *two* questions

QUESTION ONE – 30 MARKS

- (a) Failures in green houses may trigger heat loss. Briefly explain the following types of heat losses that are likely to occur in green houses structures.
- (i) Conduction heat loss
 - (ii) Infiltration heat loss
 - (iii) Perimeter heat loss (6Marks)
- (b) Define the following concepts:
- (i) Psychometric chart
 - (ii) Storage
 - (iii) Moisture isotherm (3Marks)
- (c) Protected cultivation is gaining popularity in Kenya. Differentiate between the following structures.
- (i) Greenhouse and a tunnel
 - (ii) Cold bed and hot bed (4Marks)
- (d) Briefly describe the following green house design consideration parameters.
- (i) Greenhouse orientation

- (ii) Environmental control
- (iii) Light (9Marks)

- (e) Using examples, describe three (3) ways of classifying farm structures. (6Marks)
- (f) Outline four (4) factors to be considered when sitting a greenhouse structure. (2Marks)

QUESTION TWO – 20 MARKS

- (a) Briefly explain any four (4) climatic elements that can influence the quality of environment in a horticultural structure. (8Marks)
- (b) Briefly outline the four phases of developing a horticultural structure. (8Marks)
- (c) A 8m long, 5m wide and 3m high greenhouse has two windows with a total area of 1m^2 and a door of area 1.5m^2 area for ventilation. Calculate conduction heat that can be experienced in the greenhouse when the temperature outside is 15° and temperature inside the greenhouse is 30°C . (4Marks)

QUESTION THREE – 20 MARKS

- (a) Using examples, briefly describe the following criteria of classifying storage structure. (9Marks)
 - (i) Classification based on duration of storage
 - (ii) Classification based on size/scale of storage
 - (iii) Classification based on the principle of storage
- (b) Outline the steps of carrying out an economic planting process for horticultural structures. (6Marks)
- (c) During a practical class, 2nd year students in Meru University obtained the air condition of a greenhouse. The 8m^3 per min of air at 2°C dry condition and 100% relative humidity condition was heated with $16\text{m}^3/\text{min}$ of air at 29°C dry bulb temperature and 50% humidity ratio. Assuming sea level condition, calculate
 - (i) Dry bulb temperature of the mixture
 - (ii) Humidity ratio of the mixture
 - (iii) Enthalpy of the mixture (5Marks)

QUESTION FOUR – 20 MARKS

- (a) Briefly explain the significance of crop storage towards achievement of food security in Kenya. (8Marks)
- (b) Briefly explain any four (4) psychometric chart parameters. (8Marks)
- (c) The air in a storage room has a dry bulb temperature of 15°C and 30% relative humidity. Determine any other four (4) air properties in the room. (4Marks)

QUESTION FIVE – 20 MARKS

- (a) With an aid of a diagram, outline the major types of projections that can be used to present a proposed horticultural structure drawing. (4Marks)
- (b) Before any horticultural structure is laid, surveying the site has to be carried out, briefly describe the process of surveying. (5Marks)
- (c) State any two advantages of using drip irrigation systems in greenhouse crop production. (2Marks)
- (d) State any two advantages and two disadvantages of using glass fibre as a glazing material in green houses. (2Marks)
- (e) Assume a 1:3:5 cement-sand –stone-concrete mix by volume, using naturally moist aggregates and adding 62 litres of water. Calculate the basic strength and volume of the mix if 2 bags of cement are used.

Take:

Moisture content of sand: 4%

Moisture content of stones: 1.5%

Bulk density of stone: 1400kg/m^3

Bulk density of stone: 1600kg/m^3

Solid density of aggregate material: 2650kg/m^3

Solid density of cement; 3100kg/m^3

Density of water 1000kg/m^3

(7Marks)