JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY SCHOOL OF AGRICULTURAL AND FOOD SCIENCES
UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE IN HORTICULTURE

SECOND YEAR SECOND SEMESTER 2013/2014 ACADEMIC YEAR

REGULAR

COURSE CODE: AHT 3227

COURSE TITLE: Farm Materials and Structures

EXAM VENUE:LR 3   **STREAM: BSc (Horticulture)**

DATE: 9/12/14   **EXAM SESSION: 9.00 – 11.00AM**

TIME: 2.00 HOURS

Instructions:

1. **Answer ALL question in Section A (compulsory) and ANY other TWO questions in Section B.**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

SECTION A   [30 MARKS]

Question 1
(a) Discuss the benefits and design consideration of a farm structure   [6 Marks]
(b) With reference to specific examples, discuss the following properties of metals used as
     materials for farm structure within a well established horticultural farm.   [8 Marks]
    i.   Toughness.
    ii.   Ductility.
    iii.   Malleability.
    iv.   Brittleness.
(c) Sketch a roof structure and identify the components listed below.
    i.   Truss.   [1 mark]
    ii.   Purlin.   [1 marks]
    iii.   Rafters.   [1 marks]
    iv.   Wall plate.   [1 marks]
    v.   Facia board.   [1 marks]
    vi.   King post.   [1 marks]
(d) Explain the significance of the following heat treatment processes applied to steel.

    i.   Annealing.   [2 marks]
    ii.   Normalizing.   [2 marks]
    iii.   Tempering.   [2 marks]
    iv.   Hardening.   [2 marks]
    v.   Case hardening.   [2 marks]

SECTION B [40 MARKS]

Question 2

(a)   Ferrous metal (steel) combine iron and carbon in varying a mounts.
    Explain how different proportions of carbon affect the properties of steel.   [8 Marks]

(b) In the process of working with metals, there may be need to join metal parts together.
    Describe any four methods to achieve this within a farm workshop.   [12 Marks]

Question 2

(a.) Briefly describe the following terms as applied to heat transfer within a farm structure explaining
    how each of them can be quantified. Show the mathematical equations involved.

    i.   Conduction.   [4 marks]
    ii.   Convection.   [4 marks]
    iii.   Radiation.   [4 marks]

(c) A wet –bulb temperature of 50^oF (10° C) and dry bulb temperature of 66° F (19^oC) are read from a psychrometer. For these temperatures, indicate the under listed terms on the provided Psychometric chart giving their units as well. *NB: Psychometric chart to be attached on the answer booklet.*

    i.   Relative Humidity.   [2 marks]
    ii.   Absolute Humidity.   [2 marks]
    iii.   Dew point.   [2 marks]
    iv.   Enthalpy.   [2 marks]

Question 3
(a.) Briefly discus the different types of greenhouses, qualities of covering materials and the cooling systems.   [10 Marks]

(b). Briefly discuss the following climatic/environmental factors explaining how they influence crop production within a greenhouse structure:

   i. Solar radiant flux density and quality.   [5 marks]
   ii. CO_2 / Air Composition.   [5 marks]

Question 6
(a) Pig iron is the basic material from which, wrought iron and steel are manufactured. Describe the process of its extraction from iron ore in the blast furnace. Use a labeled sketch and show the chemical reduction processes involved.   [12 Marks]
(b) Explain the difference between a crystalline and a non crystalline structure, hence describe any two crystal structures for specific metallic elements.   [8 Marks]

Psychrometric Chart

SI (metric) units
Barometric Pressure 101.325 kPa (Sea level)
based on data from
Carrier Corporation Cat. No. 794-001, dated 1975

Enthalpy at Saturation (J / gm Dry Air)

Humidity Ratio (gm Water / gm of Dry Air)

Wet Bulb or Saturation Temperature (°C)

Specific Volume 0.90 m³/kg Dry Air

50% Relative Humidity

Dry Bulb Temperature (°C)

0.030

0.025

0.020

0.015

0.010

0.005

0.000

120   140

35

100

80

25

60

20

40

15

10

20

5

0

0   -5

100% 90% 80% 70% 60% 40% 30% 20% 10% 0%

0.95

0.85

0.80

-10   -5   0   5   10   15   20   25   30   35   40   45   50   55

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