GWANDA STATE UNIVERSITY

FACULTY OF LIFE SCIENCES

DEPARTMENT OF CROP SCIENCES

BACHELOR OF SCIENCE (HONOURS) DEGREE IN CROP SCIENCE

CROP ECOLOGY AND PHYSIOLOGY

LCS 2105

First Semester Examination Paper

January 2022

This examination paper consists of 3 pages

Time Allowed:	**3 hours**
Total Marks:	**100**
Special Requirements:	**None**
Examiner's Name:	**R. Mapuranga**

INSTRUCTIONS

1. Answer any **three (3)** questions from section A and any **two (2)** questions from section B.
2. Start each question on a new page

MARK ALLOCATION

QUESTION	**MARKS**
EACH QUESTION	**20**
TOTAL ATTAINABLE MARKS	**100**

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SECTION A: ANSWER ANY THREE (3) QUESTIONS [60 MARKS]

1. (a) Define the following terms
    i. Leaf area duration (LAD) [2]
    ii. Leaf area index (LAI) [2]
   (b) Explain why crop growth rate is depressed both below and above the optimum LAI [4]
   (c) Outline how farmers can control leaf area to optimise LAI and hence increase canopy photosynthesis [12]
2. (a) Using specific examples, distinguish between source and sink in relation to photosynthesis in sorghum production [4]
   (b) Justify why the source sometimes becomes the sink during plant growth and development [4]
   (c) Briefly explain how the proximity of the source to the sink affects partitioning of assimilates in plants [4]
   (d) Explain how both source and sink strength affects partitioning of assimilates in plants [8]
3. (a) Define the term growth analysis [2]
   (b) Describe the use of crop growth rate (CGR) in growth analysis. Include the mathematical function of CGR in your answer [6]
   (c) Calculate the CGR from following data: Dry weight of groundnut (C3 plant) at t_1= 200 g/m^2 (W_1), Dry weight of groundnut at t_2 = 300 g/m^2 (W_2), Time interval of sampling (t_2-t_1) = 10 days. [2]
   (d) Discuss the growth stages most sensitive to moisture stress in groundnuts (*Arachis hypogaea* L.) [10]
4. (a) By use of a line graph, illustrate how PAR varies in a period of 24 hours. [3]
   (b) Explain how the following factors affect the distribution of PAR within a plant community
    i. Leaf arrangement and inclination [4]
    ii. Angle of the sun [4]
   (c) Assuming that you are the Head of Crop Breeding Institute (CBI), ministry of agriculture, and your team has been tasked by the minister of agriculture to develop bean cultivars with high genetic yield potential of high quality.

Recommend to your team of breeders an ideal bean ideotype capable of achieving the minister's demands.

[9]

SECTION B: ANSWER ANY TWO (2) QUESTIONS [40 MARKS]

5. (a) Differentiate between vesicular arbuscular mycorrhizal fungal – plant associations from ectotrophic mycorrhizal fungal – plant associations [4]

   (b) Explain how the knowledge of mycorrhizal – plant associations can be used to improve crop production in south west Zimbabwe [6]

   (c) Outline how the structure of the xylem vessels is adapted for water transportation, minimizing resistance to water flow and overcomes cavitation [10]

6. (a) List and define the two types of low temperature stress in plants [2]

   (b) Describe the direct and indirect damage caused by heat injury in plants [6]

   (c) Evaluate the mechanisms of heat resistance in field crops such as (*Zea mays* L.) and wheat (*Triticum aestivum* L.) [12]

7. (a) State the mechanisms of drought tolerance used by plants in drought situations [5]

   (b) Examine the management strategies to increase drought resistance in crops [5]

   (c) The use of mathematical equations to mimic growth and development of crops is called modelling. Model simulates the behaviour of a real crop by predicting how the crop will grow depending on the crop physiology and phenology and their interactions with environmental factors (radiation, temperature, soil fertility, pollutants etc). Assuming that you are the head of research in the ministry of agriculture, write short advisory notes to a group of newly appointed extension workers on the application of simulation modeling in agriculture [10]

End of the Examination Paper