

**SUSTAINABLE
AGRICULTURE
2023
YEAR 2 TO 4**



KAPASA MAKASA UNIVERSITY

PAST EXAMINATION PAPERS

2023

**DEPARTMENT OF AGRICULTURE AND AQUATIC
SCIENCES**

SECOND YEAR

COURSE CODES:

AA 210/230 ✓

NR 210

NR 230

NR 260

SA 200 ✓

SA 210 ✓

SA 220 ✓



Kapasa Makasa University

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: NR 230/AA 230

COURSE NAME: REMOTE SENSING AND GLOBAL INFORMATION SYSTEMS (GIS)

TIME ALLOWED: THREE (3) HOURS

DATE: 12TH OCTOBER 2023

TIME: 14:00HRS

INSTRUCTIONS:

- 1. There are (SIX) questions in this paper**
- 2. Answer the COMPULSORY question 1 and any other three (3) questions**
- 3. Question 1 carries 40 marks while the rest of the questions carry 20 marks each**
- 4. Please be concise (short, clear and to the point) in your explanations**

Question One

Geographic Information Science (GIScience) and Geographic Information Systems (GIS) are related but distinct fields within the realm of geospatial technology and play a very important role in land surveying.

- (a) Outline the key difference between GIScience and GIS [2 marks]
- (b) Discuss five various ways in which land surveying contributes to sustainable management of natural resources. In your discussion, provide real-world examples, case studies and or relevant statistics to support your arguments. [10 marks]
- (c) There are functions which represent the core capabilities of GIS, providing users with the tools necessary to collect, manage, analyze, visualize, and extract meaningful information from geospatial data. Describe 5 important functions commonly provided in a GIS. [10 marks]
- (d) What is the difference between datum and map projection? List any 3 map projections that you know. [5 marks]
- (e) Briefly explain any three (3) elements of image interpretation. [3 marks]
- (f) Before collecting GIS data, it's essential to carefully plan and consider various factors necessary for a successful and accuracy of the data collection process.
 - (i). Explain any 4 critical factors to take account when planning for GIS data collection [4 marks]
 - (ii). Describe 6 important components of a GIS process [6 marks]

Question Two

Write explanatory notes on All of each of the following

- (a) Spatial resolution of an image [2 marks]
- (b) Main components of the GPS technology [3 marks]
- (c) Supervised and unsupervised classification [4 marks]
- (d) Representation of GIS data model [6 marks]
- (e) Any 2 applications of Photogrammetry [2 marks]
- (f) Accuracy assessment of a classified image [3 marks]

Question Three

"Change detection" in the context of remote sensing and GIS refers to the process of identifying and analyzing differences in the Earth's surface or environment between or two more multiple time periods.

- (a) Explain why certain wavelengths are considered "windows" in the Earth's atmosphere for remote sensing. [2 marks]
- (b) Why is change detection important? Describe the fundamental steps required to undertake change detection process [7 marks]
- (c) Give meaning to each of the following key principles of image classification as important components of change detection
 - (i). Image preprocessing [2 marks]
 - (ii). Training data [2 marks]
 - (iii). Feature extraction [2 marks]

Photogrammetry is a versatile and powerful technique that leverages the principles of geometry and image analysis to generate accurate spatial data and visual representations from photographs

- (d) Define scale of an aerial photograph [1 mark]
- (e) If the focal length of the camera lens is 100 millimeters, and the aircraft's altitude is 3,000 meters (3 kilometers), calculate
 - (i). Scale of the aerial photograph [2 marks]
 - (ii). Ground coverage of the aerial photograph [2 marks]

Question Four

GIS data collection involves gathering geospatial information about the Earth's features and attributes. There are various approaches to collecting GIS data, each suited to specific purposes and requirements.

- (a) Explain two main approaches for GIS data collection, giving relative strengths and weaknesses of each approach. [6 marks]
- (b) Describe 5 important components of a GIS. [5 marks]

GIS data conversion and GIS data reduction are two distinct processes in the field of Geographic Information Systems (GIS), each with its own purpose and outcomes.

- (c) Outline the difference between the two concepts of data conversion and data reduction.

[2 marks]

- (d) What do you understand by spatial data analysis? By means of an example, explain how spatial data analysis can be used to solve a particular problem related to your field of study.

[7 marks]

Question Five

Remote sensing and Global Positioning System (GPS) technology play significant roles in modern land surveying, enhancing the accuracy, efficiency, and scope of surveying activities.

- (a) Explain the comprehensive process of land surveying and briefly highlight at least 3 main challenges associated with Land surveying.

[8 marks]

- (b) List 4 types of land surveying and briefly explain any 2 of them.

[6 marks]

- (c) Briefly outline how remote sensing and GPS technologies are applied in land surveying.

[6 marks]

Question Six

Write explanatory notes on the following

- (a) Difference between contour interval and contour gradient.

[1 mark]

- (b) Applications and properties of contour lines.

[4 marks]

- (c) Procedure that one can adopt during the process of contouring.

[3 marks]

- (d) Factors to consider while selecting a sensor for remote sensing.

[2 marks]

- (e) The concept of control networks. In your explanation include a definition, key components of a control network and three examples of its applications.

[6 marks]

- (f) Levels of spatial data analysis with clear examples.

[4 marks]

THE END

**NR230/AA210 (GLOBAL INFORMATION SYSTEMS AND
REMOTE SENSING)**

Corrections to Question Three

- 3 (e) If the focal length of the camera lens is 100 millimeters, and the aircraft's altitude is 3,000 meters (3 kilometers), and assuming the dimensions of the photograph are 0.2286m by 0.2286m, calculate
- (i). Scale of the aerial photograph
[2 marks]
 - (ii). Ground coverage of the aerial photograph
[2 marks]



Kapasa Makasa University

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: NR 260

COURSE NAME: PLANT PHYSIOLOGY AND GENETICS

TIME ALLOWED: THREE (3) HOURS

DATE: 20TH OCTOBER 2023

TIME: 14:00hrs

INSTRUCTIONS:

- 1. Answer the COMPULSORY question one from Section A**
- 2. Answer any TWO other questions from Section B**
- 3. Answer any TWO other questions from Section C**

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

NR 260 - PLANT PHYSIOLOGY AND GENETICS SESSIONAL EXAMINATION -2023

Instructions: 1. Answer the COMPULSORY QUESTION 1 in section A

2. Answer any other 2 questions from section B

3. Answer any other 2 questions from section C

SECTION A

Question One

a) Briefly but concisely explain what phytohormones are and distinguish between auxin and gibberellins

(10 marks)

b) In one of the local tribes in Chinsali District of Zambia, the frequencies of alleles determining the ABO blood group was estimated as 0.74 for group O, 0.16 for group A, and 0.10 for group B. Assuming random mating, what are the expected frequencies of ABO genotypes and phenotypes?

(10 marks)

SECTION B (PLANT PHYSIOLOGY)

Question Two

a) Give a brief account on the physical properties and importance of water to plant life.

(10 marks)

b) What do you understand by diffusion, imbibition and osmosis? How do these processes help plants to absorb water?

(10 marks)

Question Three

- a) Explain what is meant by active and passive absorption of water by plants and indicate briefly the probable processes concerned in active absorption.

(10 marks)

- b) Briefly but concisely explain what transpiration is, its significance in plant life and at least two factors affecting this process.

(10 marks)

Question Four

Write short notes on the following;

- a) Light reaction (photochemical phase) *(5 marks)*
b) Photorespiration and two factors affecting it *(5 marks)*
c) Dark reaction (biosynthetic phase) *(5 marks)*
d) Plant growth and how it is achieved *(5 marks)*

SECTION C (GENETICS)

Question Five

- a) Explain the basic differences between chromosomal and extra-chromosomal inheritance. *(5 marks)*
b) List and explain on three characteristics of cytoplasmic inheritance *(8 marks)*
c) Define the Hardy-Weinberg equilibrium and explain the conditions necessary for maintenance of equilibrium in any population *(7 marks)*

Question Six

- a) Define genetic variation and explain its importance in breeding *(5 marks)*
b) State the three ways in which it occurs in nature and give a brief but concise explanation on any of the two sources *(10 marks)*
c) Explain the basic differences between quantitative and qualitative genetics

(5 marks)

Question Seven

a) In Shorthorn cattle, both red coat color and white coat color are true breeding. Crosses of red $\times$ white produce progeny that are uniformly reddish brown but thickly sprinkled with white hairs; this type of coat color is called *roan*. Crosses of roan $\times$ roan produce $\frac{1}{4}$ red: $\frac{1}{2}$ roan: $\frac{1}{4}$ white. What kind of genetic hypothesis can explain these data? (10 marks)

b) Explain the basic difference between mitotic and meiotic cell division and their importance (5 marks)

c) State five differences between prokaryotic and eukaryotic cells (5 marks)

End of Exam.



Kapasa Makasa University

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: NR 230/AA 230

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TIME: 14:00HRS

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[8 marks]

- (b) List 4 types of land surveying and briefly explain any 2 of them.

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[6 marks]

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Write explanatory notes on the following

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[1 mark]

- (b) Applications and properties of contour lines.

[4 marks]

- (c) Procedure that one can adopt during the process of contouring.

[3 marks]

- (d) Factors to consider while selecting a sensor for remote sensing.

[2 marks]

- (e) The concept of control networks. In your explanation include a definition, key components of a control network and three examples of its applications.

[6 marks]

- (f) Levels of spatial data analysis with clear examples.

[4 marks]

THE END

**NR230/AA210 (GLOBAL INFORMATION SYSTEMS AND
REMOTE SENSING)**

Corrections to Question Three

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[2 marks]
 - (ii). Ground coverage of the aerial photograph
[2 marks]



Kapasa Makasa University

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: SA 200

COURSE NAME: BOTANY

TIME ALLOWED: THREE (3) HOURS

DATE: 20TH OCTOBER 2023

TIME: 09:00HRS

INSTRUCTIONS:

- 1. Answer the COMPULSORY question 1**
- 2. Answer any FOUR other questions from Section B**

SECTION A -Compulsory

Question One

Taxonomy is the science of classifying living things.

- i. What are the major differences between the three schools of taxonomy? [6 marks]
- ii. Explain the major limitations of the *Linnaean* hierarchy? [6 marks]
- iii. Classify the common Soya beans crop in Zambia under the following: Species, Genus, Family, Order and Class [5 marks]
- iv. In Scientific writing, Finger millet is written as *Eleusinecoracana (L.) Gaertn.* What does the *L* stands for? [1 mark]
- v. What is a taxa? [2 marks]

SECTION B: Answer four questions from this section

Question Two

Explain with an illustration the opening and closing of the guard cells during the process of photosynthesis? [20 marks]

Question Three

- i. Plants undergo many different modifications to deal with environmental challenges. Define one modified root, stem and leaf and make a case the importance of each modification? [9 marks]
- ii. Explain the adaptations that a seed has enable it to survive unfavorable conditions? [10 marks]
- iii. What is a seed? [1 mark]

Question Four

- i. Show by illustrations the differences between a compound and simple leaf? [8 marks]
- ii. What are the subsidiary functions of a leaves? [4 marks]
- iii. Show by drawings the following:
 - a. Scalloped leaf margin [2 marks]
 - b. Sessile leaf base [2 marks]
 - c. Notched leaf apex [2 marks]
 - d. Reticulate leaf venation [2 marks]

Question Five

In the past, classification of living things relied primarily on the evolution of morphological characteristics. Why is the molecular approach today so important in developing evolutionary hypothesis? [20 marks]

Question Six

In flowering plants, angiosperms are distinct from gymnosperms and other plants.

- i. What are the four major differences that distinguish angiosperms from the other plants? [8 marks]
- ii. Explain the differences between a plant and animal cell? [12 marks]

Question Seven

- i. State the basis upon which plant tissues are classified? [5 marks]
- ii. Explain the three tissue systems of plants? [9 marks]
- iii. What are the functions of parenchyma cells in plants? [6 marks]



KAPASA MAKASA UNIVERSITY
SCHOOL OF NATURAL RESOURCES
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

Sessional Examination 2023

Course Code: SA 220

Course Name: AQUACULTURE AND APICULTURE

Time Allowed: Three (3) Hours

DATE: 20TH OCTOBER 2023

INSTRUCTIONS:

1. There are **THREE** sections in this paper (Section A, B and C)
2. Section A is **COMPULSORY** (question 1)
3. Attempt any **TWO** questions in section B; and any **TWO** questions from section C
4. Question 1a to answered in the same booklet as Section B
5. Question 1b to be answered in the same booklet as Section C
6. Submit **TWO** separate answer booklets for section B and section C

SECTION A

QUESTION One (COMPULSORY)

a) In your own words, please differentiate the following terms used in aquaculture:

- i. Tank aquaculture and Raceways (2 marks)
- ii. Freshwater and brackish water (2 marks)
- iii. Semi-intensive and tank aquaculture (2 marks)
- iv. Floating feed and sinking feed (2 marks)
- v. Aquaculture and agriculture (2 marks)

b) Uncle Pojana, a small-scale farmer in Nkenyauna settlement scheme in Kasempa District wants to expand his production of honey and wax on his piece of land whose dimensions is 50.8m in width and 88.7m length. He has been spacing his hives at 10m apart. Mr Pojana now wants to reduce this spacing to 5m apart.

- i. How many hives does he have when the spacing is 10m apart? [2 marks]
- ii. If he reduces the spacing to 5m apart, how many hives will his piece of land accommodate? [2 marks]
- iii. In order to maintain his productivity with the new spacing, what measures should he take? [6 marks]

SECTION B (ANSWER ANY TWO (2) QUESTIONS)

Question Two

- a. Briefly discuss the benefits of aquaculture at the household level. (10 marks)
- b. Give a brief description of how you can conduct a site selection of an aquaculture facility of your choice. (8 marks)

Question Three

- a) Write brief notes on each of the following:
 - (i) Mono-sex culture as a method of controlling reproduction in tilapia. (5 marks)
 - (ii) State any five factors affecting primary production in water. (5 marks)
- b) Give a brief description of how you can conduct a site selection of an aquaculture facility of your choice. (10 marks)

Question Four

- a) With clear examples, explain the concept of an integrated agriculture aquaculture (IAA) system. (6 marks)
- b) In the Zambian context, state three challenges that would hinder the adoption of the recirculation aquaculture system (RAS). (6 marks)
- c) Briefly discuss some of the benefits of fencing an aquaculture facility. (8 marks)

SECTION C : Choose Two Questions from this section

Question Five

- a) Discuss the four effects of bark harvesting for hive construction on forest resources [8 marks]
- b) What are the measures used to control spread of acarine bee disease in the apiary? [12 marks]

Question Six

- a) Give reasons as to why apiculture farmers should harvest their honey during the day? [12 marks]
- b) What are the ecological variables that play an important role for bees and beekeeping activities? [8 marks]

Question Seven

- a) Discuss the importance of the three types of bees found in the colony [9 marks]
- b) What is the importance of scouting by field bees in a colony? [1 mark]
- c) Explain how Apiculture can contribute to well-being of households in Rural Parts of Zambia? [5 marks]
- d) What is the role of the extension service in the promotion of apiculture in Zambia? [5 marks]

The End

I Wish You All The Best!!!!

The Copperbelt University
Kapasa Makasa University Campus

Silviculture (NR 210) Supplementary Examinations - February 2023

Total Marks: 100

Duration: 3 hours

SECTION A – Compulsory Question

Question One

Explain the different silvicultural and breeding characteristics that are considered during tree improvements in order to come up with most valuable forestry tree species [20 marks]

SECTION B –Choose Four Questions from the Section

Question Two

Diagrammatically outline the tree breeding cycle used during crop improvement [20 marks]

Question Three

- i. List all characteristics of a plantation [7 marks]
- ii. Why is pruning of trees carried out during management of tree plantations?

[7 marks]

- iii. Explain the different types of cuttings?[6marks]

Question Four

What are the determinants for the choice of any indigenous silvicultural system to be used?
[20 marks]

Question Five

With the aid of diagrams, explain the different types of layering? [20 marks]

Question Six

- i. Explain how a Manager of a plantation is able to achieve objectives of management? [10 marks]
- ii. What are functions of a Manager of a Nursery whose objectives is to raise seedlings for a plantation?[10 marks]

Question Seven

- i. Using diagram, outline the differences between a seed and a fruit?[10 marks]
- ii. What is the difference between epigeal and hypogeal types of germination?
[4marks]
- iii. What are the good characteristics of a good seed? [4marks]
- iv. Explain the meaning of Seed dormancy [2 marks]



Kapasa Makasa University

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: SA 200

COURSE NAME: BOTANY

TIME ALLOWED: THREE (3) HOURS

DATE: 20TH OCTOBER 2023

TIME: 09:00HRS

INSTRUCTIONS:

- 1. Answer the COMPULSORY question 1**
- 2. Answer any FOUR other questions from Section B**

SECTION A -Compulsory

Question One

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- i. What are the major differences between the three schools of taxonomy? [6 marks]
- ii. Explain the major limitations of the *Linnaean* hierarchy? [6 marks]
- iii. Classify the common Soya beans crop in Zambia under the following; Species, Genus, Family, Order and Class [5 marks]
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- v. What is a taxa? [2 marks]

SECTION B: Answer four questions from this section

Question Two

Explain with an illustration the opening and closing of the guard cells during the process of photosynthesis? [20 marks]

Question Three

- i. Plants undergo many different modifications to deal with environmental challenges. Define one modified root, stem and leaf and make a case the importance of each modification? [9 marks]
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Question Six

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- i. What are the four major differences that distinguish angiosperms from the other plants? [8 marks]
- ii. Explain the differences between a plant and animal cell? [12 marks]

Question Seven

- i. State the basis upon which plant tissues are classified? [5 marks]
- ii. Explain the three tissue systems of plants? [9 marks]
- iii. What are the functions of parenchyma cells in plants? [6 marks]



KAPASA MAKASA UNIVERSITY

DEPARTMENT OF AGRICULTURE & AQUATIC SCIENCES

SA 210 (ECOLOGY)

SESSIONAL EXAMINATION - 2023

Date: Tuesday 17th October, 2023. Venue: Upper Library, Time: 09:00 to 12:00 hours

Instructions

There are two sections in this paper (**A and B**) with seven questions in total

Answer a Compulsory Question in **section A**

Answer **any four (4)** questions out of six in **section B**

There are 100 marks allocated to this paper

Each question carries 20 marks

When answering, follow further instructions in the answer booklet

SECTION A

Question One – Compulsory Question

You have been employed as a Wildlife Officer for the Lower Zambezi National Park. Part of the challenge the park is facing is the increasing number of herbivores in relation to the carnivores. As an Ecologist:

- a) Explain the consequences of the increased number of herbivores to the ecosystem of the national park. [10 marks]
- b) Suggest the remedies to the problem of increased population of herbivores. [10 marks]

SECTION B – Answer any four questions from this section

Question Two

- a) Giving examples explain what an ecosystem is? [6 marks]
- b) Every ecosystem has a flow of energy and cycling of nutrients which bind the biological and physical components together. Justify this statement [8 marks]
- c) State the steps in the operation of an ecosystem. [6 marks]

Question Three

- a) Describe a water cycle and how it can be affected by deforestation. [7 marks]
- b) Explain the three main ways in which nitrogen can be fixed in the environment. [6 marks]
- c) Differentiate between primary and secondary succession. [7 marks]

Question Four

- a) Biotic organisms in an ecosystem can be classified into three categories; Describe these categories giving examples. [6 marks]
- b) Describe the three main components of the biosphere and their importance to the ecosystem. [6 marks]
- c) Write on any four types of interactions you would find in an ecosystem. [8 marks]

Question Five

Write short notes on the following;

- a) Microclimate [4 marks]
- b) Habitat [4 marks]
- c) Pyramid of numbers [4 marks]
- d) Xerophytes [4 marks]
- e) Mesotherms [4 marks]

Question Six

- a) At every trophic level in the food chain energy decreases successively. Elaborate on this statement. [6 marks]
- b) Differentiate between tropical rain forest and tropical seasonal forest. [10 marks]
- c) What is a biome? [4 marks]

Question Seven

- a) Write on any three layers of the atmosphere. [9 marks]
- b) Climate can influence the presence or absence of organisms in an ecosystem. Expand on this statement. [6 marks]
- c) Solar energy is the driver of all major ecosystems. Amplify this statement. [5 marks]



KAPASA MAKASA UNIVERSITY

PAST EXAMINATION PAPERS

2023

**DEPARTMENT OF AGRICULTURE AND AQUATIC
SCIENCES
THIRD YEAR**

COURSE CODES:

NR 340

NR 320

NR 330

NR 310



The Copperbelt University

Kapasa Makasa University Campus

Department of Agricultural and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: NR 330

COURSE NAME: NATURAL RESOURCE ASSESSMENT

TIME ALLOWED: THREE (3) HOURS

DATE: 19TH OCTOBER 2023

TIME: 14:00hrs

INSTRUCTIONS: 1. Answer the COMPULSORY QUESTION ONE.

2. Answer any other FOUR questions

QUESTION 1

- a) As the demand on world forests have grown, scientists and professionals are increasingly called on to quantify forest composition, structure and the goods and services forest provide. Explain any THREE fields of study that are a prerequisite to the quantification of natural resources. Use examples to support your explanation. *(6 marks)*
- b) When carrying out an inventory, sample plots are established over a given area.
- Describe the type of sample plots appropriate in a natural forest
 - Describe the type of samples plots appropriate in a pine plantation
- (4 marks)*
- c) Mr Nkalamo has just been appointed as a Manager for an Agro-forestry Company which has 200000 plants. The workers narrate to him that due the drying of the boreholes each plant stayed without water for an average of 8 days per year. Explain how he can go about to determine the confidence limits for the average days without water for all plants at 99% level of confidence. *(10 marks)*

QUESTION 2

- a) A random sample of 64 trees in a forest plantation has a mean diameter of 20cm and a standard deviation of 0.4cm. this sample is used as an estimate of the average of all the trees in the forest plantation from which the sample was taken. What confidence level can we assert if we state that the mean diameter of all the trees in a forest plantation is 20cm, with a confidence interval of 19.9cm - 20.1cm? *(5 marks)*
- b) 9 trees are located in sample lot of 10m x10m. The DBH are 25cm, 30cm, 30cm, 25cm, 35cm, 35cm, 25cm, 30cm, and 35cm. Calculate the basal area of the lot. *(6 marks)*
- c) Explain the difference between Stand Density and Stand Basal Area. *(4 marks)*
- d) Explain the applicability of stand density in the management of a forest plantation. *(5 marks)*

QUESTION 3

- a) Explain how the following biodiversity measurement can help a natural resources manager in making decisions.

- i. Relative abundance
- ii. Species richness
- iii. Percentage cover

Use example to support your explanations

(12 marks)

- b) From the table below calculate the following for each are

- i. Species richness
- ii. Relative abundance
- iii. Diversity

(6 marks)

- c) Identify the area with a good evenness between A and B and explain why.

(2 marks)

Table 1: Species in two different areas A and B

Species	Area A	Area B
Dogs	150	10
Cats	150	10
Rabbits	170	25
Goats	165	25
Sheep	180	30
Cows	185	900

QUESTION 4

- a) Give precise definitions of the following

- i. Yield
- ii. Yield regulation

(5 marks)

- b) The Zambian government through ZAFFICO has embarked on plantation establishment in order to meet the rising demand of timber in the country. As a new plantations manager you have been tasked to advise the Company board on the expected yield of the plantations. Propose two possible yield regulations and explain why you feel they are appropriate. *(10 marks)*
- c) With the aid of a diagram describe Hundeshangen's method of yield regulation and explain how it can be applied in plantation management. Use examples to support your explanation. *(5 marks)*

QUESTION 5

- a) You have been tasked to measure the tree heights in a given sample plots. Explain how the measurements can be done using a Biltmore Stick and clinometers. *(8 marks)*
- b) Explain how the following tools are used in plot establishment
- i. Fiberglass measuring tape
 - ii. Compass
 - iii. Cruise vest *(6 marks)*
- c) Outline three predictions that can be made using a taper equation. *(6 marks)*

QUESTION 6

- a) You are the plantation manager of an even plantation with the length of 2000m and the width of 800m. The full maturity of the trees in the plantation is 8 years. Calculate the area to be harvested each year. *(5 marks)*
- b) Suppose that the volume harvested from a forest is $20,000\text{m}^3$ per year and the rotation period is 10 years. Calculate the total volume of the trees in the forest. *(5 marks)*
- c) Explain how yield regulation can help in the sustainable utilization of natural resources. *(6 marks)*
- d) Explain the appropriate situations for intermittent and final yield respectively. *(4 marks)*

QUESTION 7

- a) Kapasa Makasa the owner of a botanical garden, randomly selects 100 pine seedlings to find out which ones are healthy. Out of the sample 55 of them were found to be healthy.

Required :

Estimate the proportion of pine seedling which are healthy with

- i. 95% level of confidence
 - ii. 99% level of confidence *(5 marks)*
- b) Define the following terms
- i. Confidence interval
 - ii. Confidence level
 - iii. Confidence limits *(6 marks)*
- c) Explain the purpose of quantifying the natural resource. *(4 marks)*
- d) Mention two non-wood forest products and how they can be quantified. *(5 marks)*

END OF THE EXAMINATION



The Copperbelt University

Kapasa Makasa University Campus

Department of Agricultural and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: NR 330

COURSE NAME: NATURAL RESOURCE ASSESSMENT

TIME ALLOWED: THREE (3) HOURS

DATE: 19TH OCTOBER 2023

TIME: 14:00hrs

INSTRUCTIONS: 1. Answer the COMPULSORY QUESTION ONE.

2. Answer any other FOUR questions

QUESTION 1

- a) As the demand on world forests have grown, scientists and professionals are increasingly called on to quantify forest composition, structure and the goods and services forest provide. Explain any THREE fields of study that are a prerequisite to the quantification of natural resources. Use examples to support your explanation. *(6 marks)*
- b) When carrying out an inventory, sample plots are established over a given area.
- Describe the type of sample plots appropriate in a natural forest
 - Describe the type of samples plots appropriate in a pine plantation
- (4 marks)*
- c) Mr Nkalamo has just been appointed as a Manager for an Agro-forestry Company which has 200000 plants. The workers narrate to him that due the drying of the boreholes each plant stayed without water for an average of 8 days per year. Explain how he can go about to determine the confidence limits for the average days without water for all plants at 99% level of confidence. *(10 marks)*

QUESTION 2

- a) A random sample of 64 trees in a forest plantation has a mean diameter of 20cm and a standard deviation of 0.4cm. this sample is used as an estimate of the average of all the trees in the forest plantation from which the sample was taken. What confidence level can we assert if we state that the mean diameter of all the trees in a forest plantation is 20cm, with a confidence interval of 19.9cm - 20.1cm? *(5 marks)*
- b) 9 trees are located in sample lot of 10m x10m. The DBH are 25cm, 30cm, 30cm, 25cm, 35cm, 35cm, 25cm, 30cm, and 35cm. Calculate the basal area of the lot. *(6 marks)*
- c) Explain the difference between Stand Density and Stand Basal Area. *(4 marks)*
- d) Explain the applicability of stand density in the management of a forest plantation.

(5 marks)

QUESTION 3

a) Explain how the following biodiversity measurement can help a natural resources manager in making decisions.

- i. Relative abundance
- ii. Species richness
- iii. Percentage cover

Use example to support your explanations

(12 marks)

b) From the table below calculate the following for each are

- i. Species richness
- ii. Relative abundance
- iii. Diversity

(6 marks)

c) Identify the area with a good evenness between A and B and explain why.

(2 marks)

Table 1: Species in two different areas A and B

Species	Area A	Area B
Dogs	150	10
Cats	150	10
Rabbits	170	25
Goats	165	25
Sheep	180	30
Cows	185	900

QUESTION 4

a) Give precise definitions of the following

- i. Yield
- ii. Yield regulation

(5 marks)

- b) The Zambian government through ZAFFICO has embarked on plantation establishment in order to meet the rising demand of timber in the country. As a new plantations manager you have been tasked to advise the Company board on the expected yield of the plantations. Propose two possible yield regulations and explain why you feel they are appropriate. *(10 marks)*
- c) With the aid of a diagram describe Hundeshangen's method of yield regulation and explain how it can be applied in plantation management. Use examples to support your explanation. *(5 marks)*

QUESTION 5

- a) You have been tasked to measure the tree heights in a given sample plots. Explain how the measurements can be done using a Biltmore Stick and clinometers. *(8 marks)*
- b) Explain how the following tools are used in plot establishment
- i. Fiberglass measuring tape
 - ii. Compass
 - iii. Cruise vest *(6 marks)*
- c) Outline three predictions that can be made using a taper equation. *(6 marks)*

QUESTION 6

- a) You are the plantation manager of an even plantation with the length of 2000m and the width of 800m. The full maturity of the trees in the plantation is 8 years. Calculate the area to be harvested each year. *(5 marks)*
- b) Suppose that the volume harvested from a forest is $20,000\text{m}^3$ per year and the rotation period is 10 years. Calculate the total volume of the trees in the forest. *(5 marks)*
- c) Explain how yield regulation can help in the sustainable utilization of natural resources. *(6 marks)*
- d) Explain the appropriate situations for intermittent and final yield respectively. *(4 marks)*

QUESTION 7

- a) Kapasa Makasa the owner of a botanical garden, randomly selects 100 pine seedlings to find out which ones are healthy. Out of the sample 55 of them were found to be healthy.

Required :

Estimate the proportion of pine seedling which are healthy with

- i. 95% level of confidence
 - ii. 99% level of confidence *(5 marks)*
- b) Define the following terms
- i. Confidence interval
 - ii. Confidence level
 - iii. Confidence limits *(6 marks)*
- c) Explain the purpose of quantifying the natural resource. *(4 marks)*
- d) Mention two non-wood forest products and how they can be quantified. *(5 marks)*

END OF THE EXAMINATION



The Copperbelt University

Kapasa Makasa University Campus

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: NR 310

COURSE NAME: CROP SCIENCE AND HORTICULTURE

TIME ALLOWED: THREE (3) HOURS

DATE: 17TH OCTOBER 2023

TIME: 09:00hrs

INSTRUCTIONS: 1. Answer the COMPULSORY QUESTION ONE

2. Answer any other FOUR questions

INSTRUCTIONS: QUESTION ONE IS COMPULSORY AND ANSWER ANY OTHER FOUR QUESTIONS

Question One

- a) You have been invited to present a paper on different plant propagation methods by the Chinsali District Farmers' Union. What will be the contents of your presentation? *(10 marks)*
- b) Explain why some propagation methods fail to produce viable plants? *(10 marks)*

Question Two

There are different growing media that can be used in the production of flowers among which is soil. Discuss the importance of soil and at least two other growing media in flower production. *(20 marks)*

Question Three

Explain how vegetables are classified with two examples in each classification. *(20 marks)*

Question Four

- a) Give a detailed explanation of the factors that a farmer has to consider in deciding to produce cut flowers in Chinsali district of Muchinga province for a market in Lusaka Province. *(10 marks)*
- b) What are the advantages and disadvantages of producing flowers in an enclosed environment compared to an open field? *(10 marks)*

Question Five

- a) Explain the role that the elements Phosphorus and Nitrogen play in the growth of plants. *(10 marks)*
- b) What are some of the known deficiency symptoms in two commonly grown crops in Zambia? *(10 marks)*

Question Six

Give a detailed explanation of the concept of integrated pest management (IPM). *(20 marks)*

Question Seven

An orange plantation has the total area 50m X 50m

- a) Estimate the number of plants in that plantation if the planting is done at 1.5m X 2m. *(10 marks)*
- b) How much fertilizer can be applied per plant with the total fertilizer of 200 Kg? *(10 marks)*



The Copperbelt University

Kapasa Makasa University Campus

Department of Agricultural and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: NR 320

COURSE NAME: AGROCLIMATOLOGY

TIME ALLOWED: THREE (3) HOURS

DATE: 23RD OCTOBER 2023

Time: 09:00HRS

INSTRUCTIONS: 1. Answer the COMPULSORY QUESTION ONE.

2. Answer any other FOUR questions

Question One

- a) Estimate the grass reference crop ETo if pan evaporation for July 10 and 11 was 17 mm. The wind was 3 m/s, relative humidity was 50%, and the pan has a 10 m grass fetch. Assume Kpan to be 0.7. (4 marks)
- b) Compute the evaporation for the month of June from a shallow pond if the surface water temperature is 15°C, the average wind speed at 7.6 m height is 1.4 m/s, and the average temperature and relative humidity at 7.6 m height are 22°C and 40%, respectively. (12 marks)
- c) Discuss the Earth's Energy Budget. (4 marks)

Question Two

- a) Explain why the position and migration of the ITCZ are important in defining the Earth's climate on a global scale. Explain the El Niño-Southern oscillation (ENSO) phenomenon. What does it mean when there is an El Niño and La Niña season. (10 marks)
- b) Describe what a Stevenson Screen and Campbell-Stokes Sunshine Recorder are. What climatic data do they measure? (10 marks)

Question Three

List and explain the following:

- a) Four types of dry lands (8 marks)
- b) Three types of droughts (12 marks)

Question Four

Discuss the following:

- a) Climate variables and how they affect agro-forestry or agriculture (15 marks)
- b) How soil matric potential (SMP) affects crop growth (5 marks)

Question Five

- a) List and discuss the main types of tropical climates according to Köppen's climate classification. (16 marks)
- b) Briefly explain what selective absorbers are. (4 marks)

Question Six

Discuss

- a) The Carbon dioxide effect on crop photosynthesis and production *(10 marks)*
- b) How the location of southern Africa affects its climatic conditions *(5 marks)*
- c) How the oceans play an important role in the Southern region's climate *(5 marks)*

Question Seven

Explain the difference between Potential Evapo-transpiration and reference Evapo-transpiration.

List and discuss three categories of predicting evaporation from water surfaces. *(20 marks)*



The Copperbelt University

Kapasa Makasa University Campus

Department of Agricultural and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: NR 330

COURSE NAME: NATURAL RESOURCE ASSESSMENT

TIME ALLOWED: THREE (3) HOURS

DATE: 19TH OCTOBER 2023

TIME: 14:00hrs

INSTRUCTIONS: 1. Answer the COMPULSORY QUESTION ONE.

2. Answer any other FOUR questions

QUESTION 1

- a) As the demand on world forests have grown, scientists and professionals are increasingly called on to quantify forest composition, structure and the goods and services forest provide. Explain any THREE fields of study that are a prerequisite to the quantification of natural resources. Use examples to support your explanation. *(6 marks)*
- b) When carrying out an inventory, sample plots are established over a given area.
- Describe the type of sample plots appropriate in a natural forest
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- (4 marks)*
- c) Mr Nkalamo has just been appointed as a Manager for an Agro-forestry Company which has 200000 plants. The workers narrate to him that due the drying of the boreholes each plant stayed without water for an average of 8 days per year. Explain how he can go about to determine the confidence limits for the average days without water for all plants at 99% level of confidence. *(10 marks)*

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- c) Explain the difference between Stand Density and Stand Basal Area. *(4 marks)*
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- a) Explain how the following biodiversity measurement can help a natural resources manager in making decisions.

- i. Relative abundance
- ii. Species richness
- iii. Percentage cover

Use example to support your explanations

(12 marks)

- b) From the table below calculate the following for each are

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(6 marks)

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QUESTION 4

- a) Give precise definitions of the following

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(5 marks)

- b) The Zambian government through ZAFFICO has embarked on plantation establishment in order to meet the rising demand of timber in the country. As a new plantations manager you have been tasked to advice the Company board on the expected yield of the plantations. Propose two possible yield regulations and explain why you feel they are appropriate. *(10 marks)*
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QUESTION 5

- a) You have been tasked to measure the tree heights in a given sample plots. Explain how the measurements can be done using a Biltmore Stick and clinometers. *(8 marks)*
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- a) You are the plantation manager of an even plantation with the length of 2000m and the width of 800m. The full maturity of the trees in the plantation is 8 years. Calculate the area to be harvested each year. *(5 marks)*
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QUESTION 7

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- i. 95% level of confidence
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- c) Explain the purpose of quantifying the natural resource. *(4 marks)*
- d) Mention two non-wood forest products and how they can be quantified. *(5 marks)*

END OF THE EXAMINATION



The Copperbelt University

Kapasa Makasa University Campus

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: NR 340

COURSE NAME: AGRICULTURE ENGINEERING

TIME ALLOWED: THREE (3) HOURS

DATE: 25TH OCTOBER 2023

TIME: 09:00hrs

INSTRUCTIONS:

- 1. Answer the COMPULSORY QUESTION ONE**
- 2. Answer ANY other FOUR questions in the exam and follow the instructions given in the answer booklet such as "START A NEW QUESTION ON A FRESH PAGE"**

QUESTION ONE (COMPULSORY)

a) In Agroforestry practice, a rectangular field measuring 150m by 60m is to be planted with a special specie of tree and a broadcastable crop. If all the four corners of the field are to have a tree and all the trees are planted in lines which are 15m apart and the trees are also spaced 15m within the lines, how many tree seedlings are required?

If the crop is planted 50cm away from the trees, how much land in square-meters (m^2) is available for the crop? (15 marks)

b) State and briefly explain 5 factors you would consider when selecting a tractor for farm operation. (5 marks)

QUESTION TWO

(a) Calculate the cost of operation of a 15 HP Walking tractor per hour, if:-.

- The tractor was bought at K250,000
- It is planned that the tractor will be sold at K25,000 after 12 years of use
- The number of working hours are 1200 per year,
- Interest on the capital investment is 10% per year
- Cost of diesel is K30/- per litre,
- Fuel consumption is 2.5 litres per hour,
- Wages of the driver is K36,000/year,
- Lubricants cost is 30% of the fuel cost,
- Repairs and replacements is 10% of initial cost;
- Housing, Taxes and Insurance is 1.5% each of the initial cost

(15 marks)

(b) Briefly explain five (5) factors you would consider when choosing an irrigation method.

(5marks)

QUESTION THREE

a) How much will be labour cost in disking a 40ha field with a 7m wide disc harrow pulled at a speed of 80km/h by a 75Hp tractor if the driver charges K50 /hour and operate at 85% efficiency? (5 marks)

- b) How much chemical would you be putting in a 16L knapsack sprayer if it was found that the spray rate was 200L/Ha and the plant doctor recommends 2L/ha application rate? *(5 marks)*
- c) If the daily ET_c of onions, grown at KMU irrigation scheme, is 3.86 mm/day, the total available soil moisture (SM_{ta}) from the soil analysis was found to be 140 mm/m, the rooting depth at the late growth stage of onion is 0.45 and the adopted depletion (P) is 50%. What would be the irrigation frequency for onions? *(5 marks)*
- d) Calculate the area of a triangular field having sides measuring 650.0 m, 428.0 m, and 282.0 m. In addition, calculate the area irrigated if a 135m long Centre pivot rotates 60 degrees. *(5 marks)*

QUESTION FOUR

- a) Briefly explain, giving examples, how Land Surveying would help a farmer make informed decisions. *(5 marks)*
- b) Outline the steps in seed drill calibration process. *(5 marks)*
- c) Contrast Furrow from Border method of surface irrigation. *(5 marks)*
- d) Compare and contrast Animal and Mechanical sources of power for farm operation in current Zambian scenario. *(5 marks)*

QUESTION FIVE

- a) If a plough that requires a force of 2.2 KN when engaged is to be used to plough a field of 90m long, how long will it take a 2.24 hp rated pair of oxen to pull this plough from one end of the field to the other end?. *(6 marks)*
- b) State five (5) good reasons why as a policymaker you would advocate for farmers to switch from human power to mechanical power (sending a hand hoe to museum). *(5 marks)*
- c) State two (2) main functions of an injection pump and three (3) functions of a lubrication system on a diesel engine. *(5 marks)*
- c) Briefly explain the three steps in estimating the amount of water an irrigation canal delivers to the fields in a given time. *(4 marks)*

QUESTION SIX

- a) List three (3) major components of a thresher, stating the function of each component, and State four (4) operations a standard combine harvester is able to accomplish. *(5 marks)*
- b) State two (2) advantages of a Disc Plough over a Mould-board Plough and state four (3) actions that will result in increasing the depth of operation when using a Disc Harrow. *(5 marks)*
- c) Discuss the perception that Zambian small-scale farmers cannot mechanize. *(5 marks)*
- c) You have 120m length of game-wire (fencing-wire) for erecting a fence to restrict a goat. What is the biggest area a goat will get if the poles are unlimited? *(5 marks)*

QUESTION SEVEN

- a) List in chronological order, the steps used in the process of calibrating a knapsack sprayer. *(6 marks)*
- b) Contrast a two stroke engine and a four stroke engine and outline the processes in the working cycle of a four stroke diesel engine in relation to piston movement. *(10 marks)*
- c) Compare and contrast belt drive and gear drive as means of transmitting power. *(4 marks)*

GOOD LUCK.



KAPASA MAKASA UNIVERSITY
PAST EXAMINATION PAPERS
2023

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES
FOURTH YEAR AGROFORESTRY

COURSE CODE:

NR 440

NR 430

NR 450

NR 420

NR 410

AS 440



The Copperbelt University
Kapasa Makasa University Campus
Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: AS 440

COURSE NAME: FARM MANAGEMENT AND AGRICULTURE EXTENSION

TIME ALLOWED: THREE (3) HOURS

DATE: 16th OCTOBER 2023

TIME: 09:00hrs

- INSTRUCTIONS:**
1. Answer the **COMPULSORY QUESTION ONE**
 2. Question 1 a should be answered in the same booklet as any **TWO** Questions from Section B
 3. Question 1 b should be answered in the same booklet as any **TWO** Questions from Section C
 4. Submit separate answer booklets for section B and C

SECTION A

COMPULSORY QUESTION ONE

a) The balance sheet helps to measure the financial strength of the business. Given the information from the balance sheet as follows:

Total Fixed Assets	K 42,400
Total Liabilities	K 28,420
Owners' equity	K 31,830
Current Assets	K 8,650
Current Liabilities	K 7,220
Intermediate Assets	K 9,200
Intermediate Liabilities	K 3,200

i) Determine the solvency position of this business

(5 marks)

ii) Determine the liquidity position of the Business

(5 marks)

b) Discuss Edgar Dale's Cone of Experience.

(10 marks)

SECTION B (ANSWER ANY TWO QUESTIONS)

Question Two

Discuss the four functions of management and relating how the functions can be applied in a farm business.

(20 marks)

Question Three

Farming business is associated by some various forms of risks and uncertainty which you need to have in mind as you are doing your planning for the success of the business.

a) Define Risk and Uncertainty.

(4 marks)

b) What are the sources of risk and uncertainty in Agribusiness?

(8 marks)

c) How can a farmer mitigate against the mentioned risks?

(8 marks)

Question Four

Imagine you are considering an additional enterprise on your farm and after conduction a research you establish that the new investment will have the following cash flow in the next 5 years.

Year 1	- 138,000
Year 2	- 250,000
Year 3	- 350,000
Year 4	500,000
Year 5	450,000

Using the Net Present Value method, determine what will be your decision of this new enterprise on your farm. (The initial capital required is K 800,000 and the interest rate is 8%).

(20 marks)

SECTION C

Question Five

a) Discuss various factors that should be considered for selection of extension teaching methods.

(8 marks)

b) Explain the Seven R's of Audio-Visual Aids

(7 marks)

c) In details discuss different types of leadership styles

(5 marks)

Question Six

a) Write few notes on the following

- i) Rapid Rural Appraisal
- ii) Participatory Learning Approaches
- iii) Extension Education
- iv) Ethnocentrism
- v) Horizontal communication

(10 marks)

- b) Teaching, in the context of extension and development, can be thought of as providing purposeful direction through learning process. Discuss step by step processes involved in extension teaching. (10 marks)

Question Seven

- a) In details, discuss the participatory approaches below which are used in agricultural extension.
- i) Participatory Rural Appraisal
 - ii) Participatory Learning Methods
 - iii) Participation Action Research
- (6 marks)
- b) The agricultural sector in Zambia has made strides aiming at improving crop production per hector mainly through the promotion of agricultural technologies among the rural people. However, the adoption rates of such technologies are still low. Discuss various factors that affect the transfer of technologies. (8 marks)
- c) Discuss different steps in extension teaching (6 marks)

END OF THE EXAMINATION



The Copperbelt University
Kapasa Makasa University Campus
Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: NR 410

COURSE NAME: EXTENSION AND RURAL SOCIOLOGY

TIME ALLOWED: THREE (3) HOURS

DATE: 16TH OCTOBER 2023

TIME: 09:00hrs

- INSTRUCTIONS:**
- 1. Answer the COMPULSORY QUESTION ONE**
 - 2. Answer any TWO questions from Section B**
 - 3. Answer any TWO questions from Section C**
 - 4. Attempt a total of FIVE questions**

SECTION A

QUESTION 1 (compulsory)

- (a) The agricultural sector in Zambia has made strides aiming at improving crop production per hector mainly through the promotion of agricultural technologies among the rural people. However, the adoption rates of such technologies are still low. Discuss various factors that affect the transfer of technologies. (8 marks)
- (b) In details, discuss the participatory approaches below which are used in agricultural extension. (6 marks)
- i. Participatory Rural Appraisal
 - ii. Participatory Learning Methods
 - iii. Participation Action Research
- (c) The function of extension is to bring about desirable changes in human behavior by means of education. In summary, discuss such desirable changes. (6 marks)

SECTION B

QUESTION 2

- (a) The structure of society is seen as the sum total of normative behavior or the sum total of social relationships which are governed by norms. Sociologists have identified and differentiated a number of these social structures. State and explain these structures which are important in carrying out agricultural extension works. (10 marks)
- (b) What do you understand by the following terms
- i. Social stratification
 - ii. Folkways
 - iii. Mores
 - iv. Social Darwinism
 - v. Homophily

(10 marks)

QUESTION 3

(8 marks)

- (a) Discuss various basic principles of stratification
- (b) Briefly discuss the role and sociological perceptions of the following founders of sociology
- Auguste Comte
 - Herbert Spencer
 - Max Weber
 - Emile Durkheim

(8 marks)

QUESTION 4

- (a) In order for a society to function properly, culture is very important and it is defined as the sum total of the thought and behavior, leading to total way of life of people in society. As an extension worker, discuss various specific features of culture. (10 marks)
- (b) Differentiate between structural functionalist and social conflict theory. (4 marks)
- (c) With examples, describe different types of leadership styles. (6 marks)

SECTION C

QUESTION 5

- (a) The biggest distinction between rural and urban societies is that of social organization. Discuss various ways in which social organization in rural areas is different from urban areas. (10marks)
- (b). In order for an innovation transfer process to be effective, various steps are involved in the planning process of agricultural extension. Outline these steps and clearly explain their importance (10 marks)

QUESTION 6

- (a) Extension communication is never complete without adequate and correct feedback information. Explain why feedback is important. (5 marks)
- (a) List and explain various principles of agricultural extension. (8 marks)
- (b) Outline various roles of extension workers in agricultural technology transfer. (7 marks)

QUESTION 7

- (a) Sociology and extension are both important to the development of rural communities in Zambia. Describe the interrelationships that exist between the two. (10 marks)
- (b) The smooth flow of communication can be hindered by certain factors which can result into ineffective communication. In details, discuss those factors. (6 marks)
- (C) Extension teaching methods can be classified according to their forms. Discuss. (4 marks)

THE END



The Copperbelt University

Kapasa Makasa University Campus

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: NR 420

COURSE NAME: NATURAL RESOURCES POLICY AND GOVERNANCE

TIME ALLOWED: THREE (3) HOURS

DATE: 20TH OCTOBER 2023

TIME: 09:00hrs

INSTRUCTIONS: 1. Answer the any FIVE questions

2. Start each question on a fresh page as instructed in the booklet

3. Write clearly and neatly and answer critically

Question One (20 Marks)

Clearly define the following terms

- a). Modified (2)
- b). Affirmed (2)
- c). Overruled (2)
- d). The Executive (2)
- e). The Judiciary (2)
- f). Affirmed on other grounds (2)
- g). Cert denied (2)
- h). Appeal dismissed (2)
- i). Amended by (2)
- j). Cert granted (2)

Question Two (20 Marks)

Critically analyze the role of law in society (20)

Question Three (20 Marks)

- 3.1). Contrast the function of the Executive to that of the Judiciary (5)
- 3.2). Explain clearly the main court systems we have in Zambia, highlighting the kind of cases each court hears and the presiding officer in each court type (15)

Question Four (20 Marks)

- 4.1). Explain the function/purpose of law in society (10)
- 4.2). Elaborate the meaning of "bad law" (10)

Question Five (20 Marks)

Clearly describe the importance of good laws in governing natural resources, use examples where possible (20)

Question Six (20 Marks)

Clearly describe the functions of the Legislature in enabling environmental governance (20)

Question Seven (20 Marks)

Critically evaluate the following terminologies:

- a). Statute (5)
- b). Contract (5)

Describe the relevance of the Supreme court system (10)

END



The Copperbelt University
Kapasa Makasa University Campus
Department of Agricultural and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: NR 450

COURSE NAME: CLIMATE CHANGE MITIGATION AND ADAPTATION

TIME ALLOWED: THREE (3) HOURS

DATE: 25TH OCTOBER 2023

Time: 09:00HRS

INSTRUCTIONS:

- 1. Answer any FIVE questions**

Question One

As an agroforestry expert how can you go about to sensitize the locals of Chinsali on effects of climate change, causes of climate change and how you can mitigate causes of climate change.

(20 marks)

Question Two

What is the difference between a catastrophic event and Climate Change adaptation? What is Climate Change and for each of the following list two examples in relation to climate change;

a) Observed Changes

b) Events

c) Health Impacts.

(20 marks)

Question Three

How can forest-based mitigation actions be maximized? List and discuss ways in which forest based mitigation can be maximized.

(20 marks)

Question Four

Mitigation measures are inevitable to alleviate climate change effects. Discuss what is meant by Sectoral Mitigation Measures.

(20 marks)

Question Five

What is Resource Substitution? List and explain three types of resource substitution. Explain what is meant by Criticality of Environmental Technologies.

(20 marks)

Question Six

There are several distinguished types of adaptation. Define adaption, list and explain the types of adaptation. *(20 marks)*

Question Seven

The contributions of forests, forestry and wood use to climate change mitigation is multi-faceted and complex. Discuss how the principal ways of forests, forestry and wood contributions affect climate change and climate change mitigation. *(20 marks)*

END



The Copperbelt University

Kapasa Makasa University Campus

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: NR 430

COURSE NAME: PLANT PROTECTION

TIME ALLOWED: THREE (3) HOURS

DATE: 23rd OCTOBER 2023

TIME: 09:00hrs

INSTRUCTIONS: 1. This paper comprises of seven (7) questions

2. Answer the COMPULSORY QUESTION ONE

3. Answer any TWO questions from Section B

4. Answer any TWO questions from Section C

5. You are required to answer a total of five (5) questions in the exam

6. Each question carries 20 marks

SECTION A

QUESTION 1 (compulsory)

- (a) Explain various parameters used in classification and identification of plant diseases
(12 marks)
- (b) Explain how Fluorescence In-Situ Hybridization (FISH) works as a molecular method of disease identification. Further state the advantages of this molecular method.
(8 marks)

SECTION B

QUESTION 2

- (a) In details, discuss plant disease tetrahedron
(8 marks)
- (b) Define the following terms
- Stridulation
 - Phytopathogenesis
 - Biotrophs
 - Phytoanticipins
- (8 marks)
- (b) Describe various distinct stages involved in pathogenesis
(4 marks)

QUESTION 3

- (a) Insects are living organisms that belong to the class *insecta* and phylum *athropoda*. State and describe five (5) 'Orders' into which insects can be classified including examples of insects that belong to such *Orders*.
(10 marks)
- (b) Briefly explain how bacteria reproduce
(5 marks)
- (c) Describe the differences between viruses and viroids
(5 marks)

QUESTION 4

- (a) Pests are known to develop resistance to a certain pesticide after a given period of time. Discuss how this phenomenon occur (5 marks)
- (b) Explain how plants defend themselves against infections using pre-existing defense structures (10 marks)
- (c) Nematodes are known to cause a number of problems and diseases in plants. Discuss the damages caused by nematodes and how they cause such damages (5 marks)

SECTION C

QUESTION 5

- (a) Discuss similarities and differences between compound interest diseases and simple interest diseases. (10 marks)
- (b) Briefly, explain how Polymerase Chain Reaction (PCR) works as a plant disease identification method. (5 marks)
- (c) List various symptoms and signs caused by plant bacterial diseases. (5 marks)

QUESTION 6

- (a) Discuss the four-tiered approach that anchors Integrated Pest Management (IPM). (8 marks)
- (b) Explain in details how viruses invade the plant and cause diseases (4 marks)
- (C) Briefly explain various characteristics of arthropods (8 marks)

QUESTION 7

- (a) Explain various cultural practices that aim at reducing the adverse effects of plant diseases. (10 marks)
- (b) In details, explain the importance of understanding insect classifications as an Agroforester (10 marks)



The Copperbelt University

Kapasa Makasa University Campus

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: NR 440

COURSE NAME: AGROFORESTRY SYSTEMS AND TECHNOLOGIES

TIME ALLOWED: THREE (3) HOURS

DATE: 17TH OCTOBER 2023

TIME: 09:00hrs

- INSTRUCTIONS:**
- 1. Answer the COMPULSORY QUESTION ONE in Section A**
 - 2. Answer any other FOUR other questions in Section B**
 - 3. When answering the questions, STRICTLY follow the instructions given in the answer booklet**

SECTION A- Compulsory Question

Question One

Climate Change has negatively affected small scale farmers resulting in low crop production thereby affecting food security at household level. With your knowledge of Agroforestry practices;

- a) Give a detailed explanation of how farmers can integrate agroforestry practices in their farming systems in order to enhance their crop yields in the midst of climate change.

[10 marks]

- b) Green House Gases (GHGs) such as carbon dioxide have contributed to climate change.

Explain how Agroforestry practices can contribute to climate change mitigation.

[10 marks]

SECTION B – (Answer any four questions)

Question Two

Acacia albida, Tephrosiavogelli and Sesbaniasesban are some of therecommended leguminous tree species in Agroforestry systems.

- a) Describe the attributes of these tree species which make them ideal when integrated with agricultural crops.

[8 marks]

- b) As multipurpose tree species describe how a farmer can benefit from these agroforestry trees.

[6 marks]

- c) Acacia albida is an effective tree with regards to nutrient mining. Expand on this point.

[6 marks]

Question Three

Different agroforestry tree species have different rates of decomposition which affects the availability of nutrients in the soil. Given the following information; *L. leucocephala*, *G. sepium* and *F. macrophylla* which took 30.7, 21.9 and 53.4 days respectively to decompose.

- a) Which among the three above tree species would you recommend for soil improvement and why? [6 marks]
- b) *L. leucocephala* has high nitrogen to carbon ratio. Explain the meaning of this statement. [6 marks]
- c) Describe the merits and demerits of Alley Cropping. [8 marks]

Question Four

- a) Describe the commonly used green manure species and their importance to the soil. [7 marks]
- b) Why would you encourage small scale farmers to incorporate green manures in their farming? [7 marks]
- c) Describe the three principles of agroforestry. [6 marks]

Question Five

Write on the following:

- a) Improved Fallow system [5 marks]
- b) Home Gardens [5 marks]
- c) Positive and negative interactions [5 marks]
- d) Shifting cultivation [5 marks]

Question Six

Describe the following agroforestry system classifications;

- a) Structural [5 marks]
- b) Functional [5 marks]
- c) Socioeconomic [5 marks]
- d) Ecological [5 marks]

Question Seven

- a) You have been invited to give a presentation on agroforestry at an international conference. As an expert in Agroforestry systems explain the benefits of adopting agroforestry systems and technologies by small holder farmers in Zambia. [10 marks]
- b) Describe the challenges faced by most small holder farmers practicing agroforestry and suggest solutions on how best they can be addressed. [10 marks]

END OF EXAMINATION

**SUSTAINABLE
AGRICULTURE
2024
YEAR 2 TO 4**



KAPASA MAKASA UNIVERSITY
FACULTY OF APPLIED SCIENCE AND OPEN LEARNING
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES
CHINSALI, MUCHINGA PROVINCE
ECOLOGY – SA 210
END OF YEAR FINAL SESSIONAL EXAMINATION

31ST OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks **(20 Marks)**
4. Question one is **COMPULSORY**
5. Attempt a total of **FIVE** questions

CELLPHONES AND OTHER RELATED GAGETS ARE NOT ALLOWED IN THE EXAMINATION ROOM

DO NOT TURN THIS PAGE UNTIL YOU HAVE BEEN TOLD TO DO SO BY THE CHIEF INVIGILATOR

QUESTION ONE

1. Given your knowledge of Ecology, attempt any five of the following;
- A. What is the difference between a habitat and a niche? [4 marks]
 - B. Explain what carrying capacity means. [4 marks]
 - C. How does energy flow through an ecosystem? [4 marks]
 - D. What is biodiversity, and why is it important? [4 marks]
 - E. Name two examples of abiotic factors in an ecosystem. [4 marks]
 - F. What is the primary difference between primary and secondary succession? [4 marks]
 - G. How do decomposers contribute to nutrient cycling? [4 marks]
 - H. What is an invasive species, and how can it impact an ecosystem? [4 marks]

QUESTION TWO

2. Discuss the significance of biodiversity in maintaining the stability and resilience of ecosystems. How do human activities threaten biodiversity, and what are the potential consequences of reduced biodiversity? [20 marks]

QUESTION THREE

3. Describe the flow of energy through an ecosystem, beginning with primary producers and ending with decomposers. Why is energy flow different from nutrient cycling? [20 marks]

QUESTION FOUR

4. Describe the carbon cycle, emphasizing the processes of photosynthesis and respiration. How does the carbon cycle maintain a balance in the Earth's ecosystems, and how is this balance currently being disrupted by human activities? [20 marks]

QUESTION FIVE

5. Discuss the concept of nutrient cycling within an ecosystem, using the nitrogen and carbon cycles as examples. How do these cycles contribute to the sustainability of ecosystems? What are the potential risks if these cycles are disrupted? [20 marks]

QUESTION SIX

6. Discuss density-dependent and density-independent factors that regulate population size. Provide examples of each and explain how these factors can influence population stability and growth.

[20 marks]

QUESTION SEVEN

7. Describe the concept of r-selected and K-selected species, clearly providing characteristics and examples of each.

[20 marks]

-END OF EXAMINATION-



KAPASA MAKASA UNIVERSITY
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

BIOMETRY FINAL EXAMINATION FOR ACADEMIC YEAR 2024

COURSE CODE: NR 220 / AA 200

DATE : Friday, 8th November, 2024

TIME: 09:00 – 12:00 Hours

TOTAL MARKS: 60

Instructions:

1. There are two sections (A and B) and seven (7) questions in total in this exam paper.
2. Answer two (2) compulsory questions in Section A.
3. Answer any three (3) questions out of five (5) in Section B.
4. There are 100 marks allocated to this paper; each question carries 20 marks.
5. Time allowed is three (3) hours.
6. Please write legibly and include all the necessary steps in your calculations in order to get full marks.
7. No mark(s) will be given for any unclear working/calculations even if the final answer may be correct.
8. Where necessary, give your answers correct to four (4) decimal places.
9. Please be concise (short, clear and to the point) in your explanations.
10. Statistical tables are attached to the exam paper as appendices.
11. When answering questions, follow further instructions in the Question paper and Answer booklet.

QUESTION 2

- a) A peony plant with red petals was crossed with another plant having streaky petals. A geneticist states that 75% of the offspring resulting from this cross will have red flowers. To test this claim, 100 seeds from this cross were collected, sown and germinated, and 60 plants had red petals.
- What hypothesis should you use to test the geneticist's claim? [1mark]
 - Calculate the test statistic and its p -value. [5marks]
 - Use the p -value to evaluate the statistical significance of the results at the 1% level. [1mark]
- b) The table given below shows a partially completed ANOVA table for results of the statistical test for an experiment conducted using the Randomized Complete Block Design (RCBD).

Source of Variation	Degrees of Freedom (df)	Sums of Squares (SS)	Mean Squares (MS)	F – value
Treatments	4	B	D	3.87
Blocks	4	49.84	12.46	F
Error	A	86.56	E	
Total	24	C		

- Calculate the missing values (**A**, **B**, **C**, **D**, **E** and **F**) in the ANOVA table. [3marks]
- Suppose the treatments involved in the experiment were five different crop varieties (**A**, **B**, **C**, **D** and **E**) and the aim of the experiment was to compare the crop yield. Using the results in the ANOVA table and following all the steps of hypothesis testing, test whether the mean yield is the same for all the five crop varieties. Use $\alpha = 0.05$. [5marks]
- Furthermore, given that the **totals** for treatments were **54**, **31**, **41**, **33** and **29** for **A**, **B**, **C**, **D** and **E** respectively; compare treatments **A**, **B**, **C** and **D** with **E** using the Least Significant Difference (LSD) test. Interpret the results. Use $\alpha = 0.05$. [5marks]

QUESTION 4

- a) A quality control manager at a fish processing company knows from past studies that the standard deviation of the time it takes to inspect a batch of 100 fish is 16.8 minutes. A sample of 24 batches (each containing 100 fish) is selected and inspected. The standard deviation is found to be 12.5 minutes.

(i) At $\alpha = 0.05$, can it be concluded that the standard deviation has changed?

[5marks]

(ii) Construct a 95% confidence interval for the standard deviation and interpret.

[3marks]

(iii) State two assumptions you made when conducting the test.

[2marks]

- b) An experiment was conducted to evaluate the effectiveness of a treatment for tapeworm in the stomachs of sheep. A random sample of 24 worm-infected lambs of approximately the same age and health was randomly divided into two groups. Twelve of the lambs were injected with the drug and the remaining twelve were left untreated. After a 6-month period, the lambs were slaughtered and the worm counts were recorded as shown in the table below:

Drug-Treated Sheep	18	43	28	50	16	32	13	35	38	33	6	7
Untreated Sheep	40	54	26	63	21	37	39	23	48	58	28	39

Assuming that the data set can be viewed as random samples from normally distributed populations with equal variances; at $\alpha = 0.05$, does the data provide sufficient evidence that the drug was effective in treating the tapeworms in the stomachs of lambs?

[10marks]

QUESTION 5

- a) What is a sampling frame and why is it important in probability sampling methods?

[3marks]

- b) Briefly explain four major challenges associated with sampling frames. [4marks]

- c) Suppose you have a population of $N = 48$ units and a sample of $n = 4$ units is required. Explain how systematic random sampling can be used to select the sample.

[6marks]

QUESTION 7

An ecologist wanted to establish the strength and nature of relationship that exists between light and the rate of photosynthesis for a particular tree species. She obtained paired values of light interception (in $\text{mol m}^{-2}\text{s}^{-1}$) and photosynthetic rate (in $\mu\text{mol m}^{-2}\text{s}^{-1}$) on the leaves of the tree species. The results of the experiment are shown in the table below.

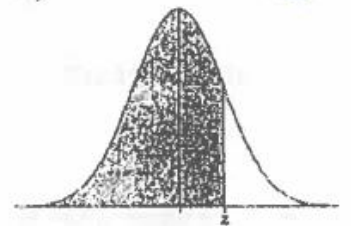
Amount of Light Intercepted	0.76	0.77	0.80	0.83	0.84	0.84	0.86	0.92	0.99	1.00	1.01
Rate of Photosynthesis	7.6	9.5	10.8	11.5	11.7	12.7	12.6	13.3	13.9	14.0	14.0

- Calculate the correlation coefficient for the data and interpret. [4marks]
- Estimate the regression line for the data. [3marks]
- Using the estimated regression line, estimate the amount of light intercepted when the rate of photosynthesis is 10.0. [2marks]
- Provide a complete ANOVA table for the regression model estimated. [4marks]
- Prove if there is sufficient evidence, using the data above, to conclude that a positive linear relationship exists between rate of photosynthesis and amount of light intercepted. Use $\alpha = 0.05$. [5marks]
- Calculate R^2 and interpret it. [2marks]

END OF EXAMINATION

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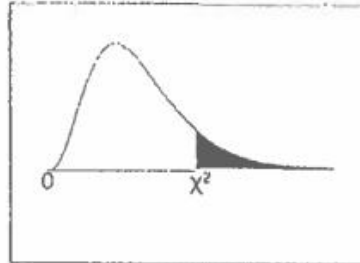
Standard Normal Cumulative Probability Table



Cumulative probabilities for POSITIVE z-values are shown in the following table:

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Chi-Square Distribution Table



The shaded area is equal to α for $\chi^2 = \chi^2_{\alpha}$.

df	$\chi^2_{.995}$	$\chi^2_{.990}$	$\chi^2_{.975}$	$\chi^2_{.950}$	$\chi^2_{.900}$	$\chi^2_{.100}$	$\chi^2_{.050}$	$\chi^2_{.025}$	$\chi^2_{.010}$	$\chi^2_{.005}$
1	0.000	0.000	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.041	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.559
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	36.741	40.113	43.195	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.993
29	13.121	14.256	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	13.787	14.953	16.791	18.493	20.599	40.256	43.773	46.979	50.892	53.672
40	20.707	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490
60	35.534	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379	91.952
70	43.275	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215
80	51.172	53.540	57.153	60.391	64.278	96.578	101.879	106.629	112.329	116.321
90	59.196	61.754	65.647	69.126	73.291	107.565	113.145	118.136	124.116	128.299
100	67.328	70.065	74.222	77.929	82.358	118.498	124.342	129.561	135.807	140.169

t Table

cum. prob one-tail two-tails	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.98}$	$t_{.995}$	$t_{.998}$	$t_{.9995}$
df	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.784	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.896	3.646	3.965
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.000	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.000	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.000	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	0.000	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.000	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.758	3.396	3.659
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	0.000	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	0.000	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232	3.460
80	0.000	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195	3.416
100	0.000	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174	3.390
1000	0.000	0.675	0.842	1.037	1.282	1.646	1.962	2.330	2.581	3.098	3.300
∞	0.000	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.090	3.291
	0%	50%	60%	70%	80%	90%	95%	98%	99%	99.8%	99.9%
	Confidence Level										



KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCES AND OPEN LEARNING
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2024 SESSIONAL EXAMINATIONS
NR230/AA230 – REMOTE SENSING & GIS
TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS

- (a) There are seven questions in this paper. Answer only **Five (5)**.
- (b) Be brief and cogent in your answers.
- (c) Be neat and legible.

DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO.

QUESTION 1

- (a) Describe any map projection that you know [3].
- (b) Identify at least three fundamental instruments used in land surveying, and explain how each is applied in land surveying [3, 3].
- (c) Explain the concept of a coordinate system and its importance in land surveying. Compare the differences between geographic coordinate systems and projected coordinate systems [6, 4].
- (d) Describe three primary approaches to GIS data collection and any three GIS data input methods [3, 3].

QUESTION 2:

- (a) Explain the role of satellite platforms in remote sensing, and describe the advantages and limitations of using satellites compared to aerial platforms such as drones or airplanes. [2, 3, 3]
- (b) What role has Google Earth played in shaping the private sector's approach to remote sensing, and how have its innovations transformed data access and visualization in the field of remote sensing? [6]
- (c) Outline the difference between data conversion and data reduction. Explain the importance of these 2 concepts in GIS and remote sensing. [2, 4]
- (d) What is Aerial photography? Explain four key differences between aerial photography and satellite imagery. [1, 4]

QUESTION 3

- (a) Using a table, outline four major atmospheric windows used in remote sensing and their characteristics. [4, 4]
- (b) Briefly describe the Landsat satellite program, state any 2 key features of Landsat imagery, and how it is utilized in your field of study? [4,2,2]
- (c) State the primary objective of network analysis and clearly describe at least three applications of network analysis in solving real-world problems. [2, 3]
- (d) What is a Digital Elevation Model (DEM), and how is it different from Digital Surface Model (DSM)? Discuss one of its applications in GIS. [4]

QUESTION 4

- (a) Why is it necessary to check the accuracy of a classified image? Outline the steps involved in accuracy assessment of a classified image. [2, 6]
- (b) Discuss four approaches that can be employed to improve classification accuracy of a classified image. [4]
- (c) What are the common metrics used to evaluate the accuracy of remote sensing image classification, and how do they provide insights into the classification performance? [4, 4]
- (d) What is contouring in land surveying, and describe any three applications in the field of land surveying? [2,3]

QUESTION 5:

- (a) Explain the four levels of spatial data analysis. [6]
- (b) What is image overlap in photogrammetry? Explain the different types of image overlap, and discuss why overlapping images are essential for generating accurate and reliable spatial data. [2, 2, 6]
- (c) Define the term "band combinations" and provide two examples. Discuss its significance in image interpretation and analysis. [3, 2]
- (d) Write any four internet platforms where satellite imagery can be accessed for free. [4]

QUESTION 6:

- (a) Outline the primary components of a Geographic Information System (GIS) and explain how each component contributes to the overall functionality of GIS in spatial data analysis. [6]
- (b) Compare and contrast raster and vector data models in GIS. Provide examples of scenarios where each data model is most appropriately used. [4, 2]
- (c) Explain the comprehensive process of land surveying and briefly highlight at least 3 main challenges associated with Land surveying. [5,3]
- (d) List four types of sampling methods and explain three reasons why sampling is important during the process of accuracy assessment for a classified image. [2, 3]

QUESTION 7

- (a) Explain the concept of photogrammetry, and discuss any two applications of this technique. [2, 4]
- (b) Differentiate aerial photogrammetry and terrestrial photogrammetry, and explain the specific applications and advantages of each. [2,3,3]
- (c) Briefly outline how remote sensing and GPS technologies are applied in land surveying. [3,3]
- (d) Briefly explain the following five fundamental concepts of land surveying: Scale, Unit of Measurement, Levelling, Errors and Accuracy. [5]

THE END



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FACULTY OF APPLIED SCIENCE AND OPEN LEARNING
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES
BACHELOR OF ARTS IN SUSTAINABLE AGRICULTURE
AQUACULTURE – SA 220
END OF YEAR FINAL SESSIONAL EXAMINATION

23RD OCTOBER 2024, 09: 00 HRS

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks (**20 Marks**)
4. Question one is **COMPULSORY**
5. Attempt a total of **FIVE** questions. One compulsory question and two questions from each section.
6. This paper consists of **THREE SECTIONS**:
 - A. **SECTION A**: Compulsory question
 - B. **SECTION B**: Aquaculture
 - C. **SECTION C**: Apiculture
7. Do **NOT** write in pencil (except for graphs and diagrams).
8. The marks shown against the requirement(s) for each question should be taken as an indication of the expected length and depth of the answer.
9. All workings must be done in the answer booklet.
10. Present legible and tidy work.

CELLPHONES AND OTHER RELATED GAGETS ARE NOT ALLOWED IN THE EXAMINATION ROOM
DO NOT TURN THIS PAGE UNTIL YOU HAVE BEEN TOLD TO DO SO BY THE CHIEF INVIGILATOR

SECTION A (COMPULSORY)

QUESTION ONE. (PLEASE USE DIFFERENT ANSWER BOOKLETS FOR PART A AND B)

QUESTION ONE

1.

A. A visit was undertaken to Kapasa Makasa University (KMU) Fish farm during the training as a way of exposing and solidifying the concepts that you learnt in class. As such, the following questions are based on the KMU fish farm visit and some concepts learnt in class.

i. What type of culture facilities were found at the farm? **[1 Mark]**

ii. Using Scientific names, mention any two species of fish cultured at KMU.

[2 Marks]

iii. State one measure of biosecurity found at the farm and provide three suggestion that could be used to improve the biosecurity status of the farm.

[3 Marks]

iv. What form of value addition is done at the farm? **[1 Mark]**

v. Explain briefly how phytoplankton levels can be determined in a culture facility. **[3 Marks]**

B. Discuss the biggest threats to beekeeping in Zambia **[20 marks]**

SECTION B: AQUACULTURE

PLEASE CHOOSE ANY TWO QUESTIONS FROM THIS SECTION AND ALL QUESTIONS CARRY EQUAL MARKS (20 MARKS).

QUESTION TWO

2.

A. Define the following terms;

i. Disease **[1 Marks]**

ii. Nutrient **[1 Marks]**

iii. Hypophysation **[1 Marks]**

- B. Explain briefly what would happen if one of the nodes of the aquaculture value chain is poorly operated or executed [2 Marks]
- C. You have been invited by Mrs. Tembo of Chibombo district to make a farm visit and do an assessment for earthen pond aquaculture development. Explain three main factors which your farm assessment would focus on. [3 Marks]
- D. In reference to Table 1, Calculate the Feed Conversion Ratio (FCR) for the three species and suggest which one of the three species would not make a better species for farming and why. [10 marks]

Table 1: Data about three fish species

FISH SPECIES	QUANTITY OF FEED ADMINISTERED (G)	WEIGHT GAINED (G)
<i>Labrus bergylta</i>	4.8	3.1
<i>Lates calcarifer</i>	5.2	2
<i>Cyprinus carpio</i>	10.7	9.7

- E. Why is it important from an aquaculture perspective to know or study reproductive diversity. [2 Marks]

QUESTION THREE

3.

- A. A prospective fish farmer has been doing personal research on YouTube, she came across some technical words that she needs further information on and you have been contacted to help. Compare
- Broodstock and fingerlings [2 Marks]
 - Fish and Fishes [2 Marks]
 - Zooplankton and phytoplankton [2 Marks]
- B. In aquaculture, understanding puberty of your fish species is critical because both Early and Late puberty can be a problem. With examples, discuss the previous statement [4 Marks]
- C. Nutritional requirements for fish vary from species to species and or fish to fish. Explain two (2) factors that affect nutritional requirements of fish. [4 Marks]
- D. List any two living organisms that causes fish diseases and for each provide an example of a diseases that it causes. [4 Marks]
- E. In order to operate a fish hatchery, having quality and quantity broodstock is paramount. List any two sources of quality broodstock for hatcheries. [2 Marks]

QUESTION FOUR

4.

- A. Fish Cages are one of the water-based aquaculture facilities that are being utilised in many countries including Zambia. With the aid of a diagram, discuss the functions of the major components of a fish cage. **[5 Marks]**
- B. Imagine that you've graduated from KMU and you are employed as a farm manager at GPS Farms in Mbala district. You are tasked to construct five fish ponds. Briefly discuss three key factors you would consider when selecting an ideal or appropriate site for ponds construction. **[6 marks]**
- C. You have been employed as an extension Officer and a women's Cooperative invites you to train them on fish feed formulation. You have been provided with Fish Meal (FM) and Maize Bran (MB) having 60% and 13% Protein, respectively and the species for which this On-Farm feed is to be formulated requires at least 25% Protein. Using Pearson Square Method, calculate the quantities of each ingredient required if you are to prepare 1000 grams of feed. **[5 marks]**
- D. Discuss the four (4) types of fish mouth and how they relate to feeding **[4 Marks]**

SECTION C: APICULTURE

PLEASE CHOOSE ANY TWO QUESTIONS FROM THIS SECTION AND ALL QUESTIONS CARRY EQUAL MARKS (20 MARKS)

QUESTION FIVE

5. Explain the factors that are considered when selecting a site for apiary establishment?

[20 marks]

QUESTIONS SIX

6.

- A. Explain the importance of the Queen's pheromone glands **[10 marks]**

- B.** Discuss the effect of Zambia's Agro-ecological Zones on the production of honey and its products **[10 marks]**

QUESTION SEVEN

7.

- A.** What equipment and protective clothing's that one must have whenever you want to remove honey from the hive? **[10 marks]**
- B.** State the limiting factors to the Zambia achieving high production of honey and its related products? **[10 marks]**

..... **END OF EXAM**.....



KAPASA MAKASA UNIVERSITY
FACULTY OF APPLIED SCIENCE AND OPEN LEARNING
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES
CHINSALI, MUCHINGA PROVINCE
BOTANY – SA 200
END OF YEAR FINAL SESSIONAL EXAMINATION

15TH OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks **(20 Marks)**
4. Question one is **COMPULSORY**
5. Attempt a total of **FIVE** questions

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QUESTION ONE

1. Zambia is facing unprecedented droughts as a result of climate change that have threatened food security. As a student of sustainable agriculture, discuss how the knowledge you have acquired in Botany as a course would help government in coming up with adaptation measures that would ensure that food security is guaranteed in the next 5 years. **(20 marks)**

QUESTION TWO

2.
 - A. Discuss the importance of Bryophytes in our ecosystems **[4 marks]**
 - B. What are the differences between the two divisions of spermatophytes in plants **[8 marks]**
 - C. State the principles that are followed under the rules of international codes in plant taxonomy **[8 marks]**

QUESTION THREE

3.
 - A. Explain the three subdivisions of Cymose or sympodial branching **[6 marks]**
 - B. Differentiate the four sub-aerial modified stems **[12 marks]**
 - C. What are Cryptogams **[2 marks]**

QUESTION FOUR

4.
 - A. With an example, explain opposite phyllotaxy in plant leaves **[8 marks]**
 - B. State the four different types of leaves **[4 marks]**
 - C. Discuss the different regions of roots **[8 marks]**

QUESTION FIVE

5. With help of drawings, explain in detail how the phloem tissues are physiologically adapted to perform the function of transporting sugars. **[20 marks]**

QUESTION SIX

6.
 - A. Discuss the three types of ground tissue system in plants **[15 marks]**

B. What are the functions of fruits

[5 marks]

QUESTION SEVEN

7.

A. Explain in detail the three different types of floral variations in plants

[12 marks]

B. State the conditions that help to trigger germination of seeds

[8 marks]

END OF EXAMINATION, BEST WISHES.



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FACULTY OF APPLIED SCIENCE AND OPEN LEARNING

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

CHINSALI, MUCHINGA PROVINCE

NATURAL RESOURCE ASSESSMENT – SA 310

END OF YEAR FINAL SESSIONAL EXAMINATION

05TH NOVEMBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks (**20 Marks**)
4. Question one is **COMPULSORY**
5. Attempt a total of **FIVE** questions. Two from each section.
6. Do **NOT** write in pencil (except for graphs and diagrams).
7. The marks shown against the requirement(s) for each question should be taken as an indication of the expected length and depth of the answer.
8. All workings must be done in the answer booklet.
9. Present legible and tidy work.

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QUESTION ONE

1. The table below is an assumption of the population of vehicles in Zambia with their corresponding engine capacity, carbon emission capacity and carbon tax charge for each type of a vehicle per year. Required:

Table 1: Carbon Emissions from Vehicles

Population Of Vehicles	Engine Capacity (Cc)	Carbon Emission Capacity for Each Vehicle Per Year (Tonnes)	Carbon Tax Charge for Each Vehicle Per Year (K)
500000	1.0	0.5	150
250000	2.0	1.0	200
250000	2.5	1.5	250

- A. Using the information given in the table below, calculate the total amount of carbon emission from the vehicles in Zambia per year. **[6 mark]**
- B. Calculate the total amount of carbon tax revenues collected from the motorist in Zambia per year. **[6 mark]**
- C. Recommend one type of carbon sequestration method the Zambian government can adopt to capture carbon emissions from the vehicles and explain why you think it is the best option. **[4 mark]**
- D. Describe two (2) disadvantages of carbon sequestration. **[4 mark]**

QUESTION TWO

2.

- A. Give precise definitions of the following
- i. Yield **[2.5 marks]**
 - ii. Yield regulation **[2.5 marks]**
- B. The Zambian government through ZAFFICO has embarked on plantation establishment in order to meet the rising demand of timber in the country. As a new Plantation Manager, you have been tasked to advice the Company board on the expected yield of the plantations. Propose two possible yield regulations and explain why you feel they are appropriate. **[10 marks]**

- C. With the aid of a diagram describe Hundeshangen's method of yield regulation and explain how it can be applied in plantation management. Use examples to support your explanation. [5 marks]

QUESTION THREE

3.

- A. Suppose that you want to carry out an inventory from a 100 acres forest land, using the sample plots of a tenth acre each. Calculate the number of plots needed for your inventory at 2% desired cover of plots. [4 marks]
- B. Assuming that half of the needed number of sample plots you calculated in (a) consists of five (5) trees each and the other half consist of ten (10) trees each. Calculate the landscape tree density of that given forest land. [8 marks]
- C. Explain the application of **quadrats** in natural resources assessment. Use examples to support your explanation [4 marks]
- D. Explain the procedure of using **line transects** in measuring natural resources. [4 marks]

QUESTION FOUR

4.

- A. A random sample of 64 trees in a forest plantation has a mean of 20cm and a standard deviation of 0.4cm. This sample is used as an estimate of the average of all the trees in the forest plantation from which the sample was taken. What confidence level can we assert if we state that the mean diameter of all the trees in a forest plantation is 20cm, with a confidence interval of 19.9cm - 20.1cm (calculate the basal area?) [5 marks]
- B. 9 trees are located in sample lot of 10m x10m. The DBH are 25cm, 30cm, 30cm, 25cm, 35cm, 35cm, 25cm, 30cm, and 35cm. [6 marks]
- C. Explain the difference between Stand Density and Stand Basal Area. [4 marks]
- D. Explain the applicability of stand density in the management of a forest plantation.

[5 marks]

QUESTION FIVE

5.

- A. Kapasa Makasa the owner of a botanical garden, randomly selects 100 pine seedlings to find out which ones are healthy. Out of the sample 55 of them were found to be healthy.

Required: Estimate the proportion of pine seedlings which are healthy with

i. 95% level of confidence [2.5 marks]

ii. 99% level of confidence [2.5 marks]

- B. Define the following terms

i. Confidence interval [2 marks]

ii. Confidence level [2 marks]

iii. Confidence limits [2 marks]

- C. Explain the purpose of quantifying the natural resource [4 marks]

- D. Mention two non-wood forest products and how they can be quantified [5 marks]

QUESTION SIX

6.

- A. You have been tasked to Measure the tree heights in a given sample plot. Explain how the measurements can be done using a Biltmore Stick and a clinometer. [8 marks]

- B. Explain how the following tools are used in plot establishment

i. Fiberglass measuring tape [2 marks]

ii. Compass [2 marks]

iii. Cruise vest [2 marks]

- C. Outline three predictions that can be made using a taper equation. [6 marks]

QUESTION SEVEN

7.

A. Use example to support your explanations, explain how the following biodiversity measurement can help a natural resources manager in making decisions.

- i. Relative abundance [4 marks]
- ii. Species richness [4 marks]
- iii. Percentage cover [4 marks]

B. From the table below calculate the following for each:

Table 2: Species in two different areas A and B

Species	Area A	Area B
Dogs	150	10
Cats	150	10
Rabbits	170	25
Goats	165	25
Sheep	180	30
Cows	185	900

- i. Species richness [2 marks]
- ii. Relative abundance [2 marks]
- iii. Diversity [2 marks]

C. Identify the area with a good evenness between A and B and explain why? [2 marks]



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DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES
CHINSALI, MUCHINGA PROVINCE
CROP SCIENCE AND HORTICULTURE – SA 300
END OF YEAR FINAL SESSIONAL EXAMINATION

21ST OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks (**20 Marks**)
4. Question one is **COMPULSORY**
5. Attempt a total of **FIVE** questions

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QUESTION ONE

1.

- A. Estimate the number of cabbage plants expected in the field of one hectare with the spacing of 50cm between plants and 90cm between rows. (12 Marks)
- B. Calculate the quantity of fertilizer to apply per plant if the farmer has a total of 200kg. (8 marks)

QUESTION TWO

2.

- A. Vegetables can be grown using different media. Discuss the benefit of growing vegetables using the soil as a growing medium. (13 Marks)
- B. Hydroponics is another method of growing horticultural crops. Give reasons why it should be practiced (7 marks)

QUESTION THREE

- 3. Mrs. Kalikeka a resident of Chinsali would like to set up a project to grow cut flowers and she has been advised to grow using out door field. As a student studying crop science and horticulture, why should you discourage her? (20 Marks)

QUESTION FOUR

4.

- A. In details, discuss various factors that should be considered to come up with the nursery? (8 Marks)
- B. Mention management practices to care for the nursery (12 Marks)

QUESTION 5

- 5. You have been employed as a manager at the farm growing cut flowers in the green house. What measures can you take inside the green house to adjust?
 - A. Temperature high and low. (8 Marks)
 - B. Humidity low and high (8 Marks)
 - C. Low Carbon dioxide levels (4 Marks)

QUESTION SIX

6.

- A. Explain the importance of flowers. (10 marks)
- B. With examples, classify various types of flowers 10 Marks

QUESTION SEVEN

7.

- A. Define integrated pest management (IPM). (13 Marks)
- B. Explain management practices that can be applied at the farm where both crops and animals are kept (7 Marks)

END OF EXAMINATION, BEST WISHES

QUESTION ONE

1. Zambia is facing unprecedented droughts as a result of climate change that have threatened food and energy securities. As a student of sustainable agriculture, discuss in details five solutions you would advise government to take to ensure that food security is guaranteed in the next 5 years. [20 marks]

QUESTION TWO

2.
 - A. State the two factors that make *Chitemene* an ecologically sound system? [4 marks]
 - B. Explain how *Chitemene* system of farming poses many threats to the environment [8 marks]
 - C. Discuss the improvements that have been made to the fundikila system of agriculture to make it sustainable. [8 marks]

QUESTION THREE

3.
 - A. What are the principles of Conservation Agriculture [12 marks]
 - B. Explain why conventional land preparation methods are not encouraged among all categories of farmers in Zambia. [8 marks]

QUESTION FOUR

4. Discuss the five carbon farming practices and the one advantage of each practice. [20 marks]

QUESTION FIVE

5.
 - A. State the social benefits of sustainable organic farming. [5 marks]
 - B. Zambia is divided into four agro ecological zones. Explain the effect of the agro-ecological zones on crop distribution and diversity in Zambia. [12 marks]
 - C. What is *Bokashi*? [3 marks]

QUESTION SIX

6. You have been given time to give a lecture to members of KUSAS at Kapasa Makasa University on compost manure making and its benefits. Prepare a lecture how you would go about it [20 marks]



KAPASA MAKASA UNIVERSITY
FACULTY OF APPLIED SCIENCE AND OPEN LEARNING
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES
CHINSALI, MUCHINGA PROVINCE
SUSTAINABLE AGRICULTURE SYSTEMS – SA 320
END OF YEAR FINAL SESSIONAL EXAMINATION

31ST OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks (**20 Marks**)
4. Question one is **COMPULSORY**
5. Attempt a total of **FIVE** questions

CELLPHONES AND OTHER RELATED GAGETS ARE NOT ALLOWED IN THE EXAMINATION ROOM

DO NOT TURN THIS PAGE UNTIL YOU HAVE BEEN TOLD TO DO SO BY THE CHIEF INVIGILATOR

QUESTION SEVEN

7.

- A.** Discuss the principles of Agroforestry **[6 marks]**
- B.** From a tree-crop/animal interface of agroforestry, explain the negative interactions that may arise. **[14 marks]**

END OF EXAMINATION, BEST WISHES.



KAPASA MAKASA UNIVERSITY

FACULTY OF APPLIED SCIENCE AND OPEN LEARNING

DEPARTMENT OF AGRICULTURAL AND AQUATIC SCIENCES

COURSE NAME: ANIMAL HUSBANDRY

COURSE CODE: SA 330

END OF YEAR SESSIONAL EXAMINATIONS

DATE: 5TH NOVEMBER 2024

INSTRUCTIONS TO THE CANDIDATES

1. TIME ALLOWED IS THREE (3) HOURS
2. REMEMBER TO WRITE YOUR STUDENT IDENTITY NUMBER ON THE PROVIDED ANSWER SHEETS
3. ALL QUESTIONS CARRY EQUAL MARKS (20 MARKS)
4. QUESTION ONE IS COMPULSORY
5. ATTEMPT A TOTAL OF FIVE (5) QUESTIONS

b) What are the key management practices to be done in a pig fattening pen? **{10 marks}**

Question Six

a) A broiler diet is found to be deficient by 15% of the required 17.7kg of calcium in a bulk ration meant to feed a large number of birds. How much limestone flour with 36% calcium will be incorporated in the ration to make up for the deficiency? **{5 marks}**

b)

i) A farmer has a readily available shed which can accommodate 600 by 70kg bags of stock-feed. If he has to maximize the usage of the shed, formulate a 22% crude protein pig starter ration from the following ingredients: 65% crude protein blood meal; 64% crude protein fish meal; 9.8% crude protein wheat meal; 7% crude protein maize meal; 44% crude protein soya-bean meal and 4.5% crude protein cassava meal.

The farmer is assured of 100 by 50kg bags of blood meal from the local meat processing plant and he has left-over stock of 45 tons of cassava meal from last years' harvest. Wheat meal is to make up 30% of the energy sources. **{12 marks}**

ii) If the farmer has 10,000 weaner pigs each consuming 1.2kg per day, work out how long he will feed the pigs before the feed completely runs out. **{3 marks}**

Question Seven

a) Discuss the feeding features of the following ingredients for non-ruminant animals:

Soya beans **{2 marks}**

Cotton seed **{2 marks}**

Fish meal **{2 marks}**

b)

i) Discuss the factors to consider when assigning housing for day old chicks and the grower house. **{8 marks}**

ii) What is to be considered when considering the location of the human dwellings on the farm?

{6 marks}

END OF THE EXAMINATION – ALL THE BEST

Nutrient requirements for growing/finishing steer calves and yearlings (nutrient conc' in diet dry matter) -
From NRC Publication # 4, Beef cattle

Weight (kg)	Targeted LWT daily gain (kg)	Minimum dry matter consumption (kg)	Roughage (%)	Total protein (%)	Metabolisable energy (Mcal/kg)	Ca (%)	P (%)
<100	0 (maintenance)	2.1	100	8.7	2.0	0.18	0.18
	0.5	2.9	70 - 80	12.4	2.2	0.48	0.38
	0.7	2.7	50 - 80	14.8	2.5	0.7	0.48
	0.9	2.8	25 - 30	16.4	2.8	0.86	0.57
	1.1	2.7	15	18.2	3.1	1.04	0.70
150	0	2.8	100	8.7	2.0	0.18	0.18
	0.5	4.0	70 - 80	11.0	2.2	0.35	0.32
	0.7	3.9	40 - 60	12.6	2.5	0.46	0.36
	0.9	3.9	15 - 30	14.1	2.8	0.61	0.45
	1.1	3.7	15	15.6	3.1	0.76	0.54
200	0	3.5	100	8.5	2.0	0.18	0.18
	0.5	5.8	80 - 90	9.9	2.1	0.18	0.18
	0.7	5.7	70 - 80	10.8	2.3	0.32	0.28
	0.9	4.9	35 - 45	12.3	2.7	0.47	0.37
	1.1	4.6	15	13.6	3.1	0.59	0.43
250	0	4.1	100	8.5	2.0	0.18	0.18
	0.7	5.8	55 - 65	10.7	2.5	0.31	0.28
	0.9	6.2	45 - 50	11.1	2.6	0.35	0.31
	1.1	6.0	20 - 25	12.1	2.8	0.43	0.35
	1.3	6.0	15	12.7	3.1	0.50	0.38
300	0	4.7	100	8.5	2.0	0.18	0.18
	0.9	8.1	55 - 65	10.0	2.5	0.31	0.28
	1.1	7.6	20 - 25	10.8	2.8	0.33	0.29
	1.3	7.1	15	11.7	3.0	0.41	0.32
	1.4	7.3	15	11.9	3.1	0.42	0.34
350	0	5.3	100	8.5	2.0	0.18	0.18
	0.9	8.0	45 - 55	10.0	2.6	0.25	0.22
	1.1	8.0	20 - 25	10.4	2.8	0.29	0.28
	1.3	8.0	15	10.8	3.0	0.32	0.28
	1.4	8.2	15	10.9	3.1	0.34	0.29
400	0	6.4	100	8.5	2.0	0.18	0.18
	1.0	10.3	45 - 55	9.3	2.6	0.19	0.19
	1.2	10.2	20 - 25	9.5	2.8	0.23	0.22
	1.3	9.3	15	10.4	3.1	0.26	0.25
	1.4	9.8	15	10.0	3.1	0.26	0.23

Nutrient requirements for growing/finishing steer calves and yearlings (nutrient conc' in diet dry matter) -
From NRC Publication # 4, Beef cattle

Weight (kg)	Targeted LWT daily gain (kg)	Minimum dry matter consumption (kg)	Roughage (%)	Total protein (%)	Metabolisable energy (Mcal/kg)	Ca (%)	P (%)
<100	0 (maintenance)	2.1	100	8.7	2.0	0.18	0.18
	0.5	2.9	70 - 80	12.4	2.2	0.48	0.38
	0.7	2.7	50 - 80	14.8	2.5	0.7	0.48
	0.9	2.8	25 - 30	16.4	2.8	0.86	0.57
	1.1	2.7	15	18.2	3.1	1.04	0.70
150	0	2.8	100	8.7	2.0	0.18	0.18
	0.5	4.0	70 - 80	11.0	2.2	0.35	0.32
	0.7	3.9	40 - 60	12.6	2.5	0.46	0.36
	0.9	3.9	15 - 30	14.1	2.8	0.61	0.45
	1.1	3.7	15	15.6	3.1	0.76	0.54
200	0	3.5	100	8.5	2.0	0.18	0.18
	0.5	5.8	80 - 90	9.9	2.1	0.18	0.18
	0.7	5.7	70 - 80	10.8	2.3	0.32	0.28
	0.9	4.9	35 - 45	12.3	2.7	0.47	0.37
	1.1	4.6	15	13.6	3.1	0.59	0.43
250	0	4.1	100	8.5	2.0	0.18	0.18
	0.7	5.8	55 - 65	10.7	2.5	0.31	0.28
	0.9	6.2	45 - 50	11.1	2.6	0.35	0.31
	1.1	6.0	20 - 25	12.1	2.8	0.43	0.35
	1.3	6.0	15	12.7	3.1	0.50	0.38
300	0	4.7	100	8.5	2.0	0.18	0.18
	0.9	8.1	55 - 65	10.0	2.5	0.31	0.28
	1.1	7.6	20 - 25	10.8	2.8	0.33	0.29
	1.3	7.1	15	11.7	3.0	0.41	0.32
	1.4	7.3	15	11.9	3.1	0.42	0.34
350	0	5.3	100	8.5	2.0	0.18	0.18
	0.9	8.0	45 - 55	10.0	2.6	0.25	0.22
	1.1	8.0	20 - 25	10.4	2.8	0.29	0.28
	1.3	8.0	15	10.8	3.0	0.32	0.28
	1.4	8.2	15	10.9	3.1	0.34	0.29
400	0	6.4	100	8.5	2.0	0.18	0.18
	1.0	10.3	45 - 55	9.3	2.6	0.19	0.19
	1.2	10.2	20 - 25	9.5	2.8	0.23	0.22
	1.3	9.3	15	10.4	3.1	0.26	0.25
	1.4	9.8	15	10.0	3.1	0.26	0.23



KAPASA MAKASA UNIVERSITY

SCHOOL OF NATURAL RESOURCES

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2024/25 SESSIONAL EXAMINATIONS

SA340

SOIL AND WATER MANAGEMENT

INSTRUCTION: 1. There are seven questions in total

2. Answer a compulsory question in **SECTION A**

3. Answer any four (4) questions out of the six in **SECTION B**

4. There are 100 marks allocated to this paper

5. Where possible illustrate your answers

7. When answering follow further instructions in the answer boo

SECTION A: Compulsory Question-40 Marks

Question No.1

Mr. John Banes Chomba recently retired and upon getting his pension he acquired a 200-hectare farm in the interior of the Manshya Farm block of Chinsali District. He intends to go into production of fruits and vegetables, and the average rainfall around his farm is below normal. He further engages you as a fresh graduate of soil and water management from Kapasa Makasa University as a consultant over issues of Irrigation, Soil texture and also the status of the soils in terms of Infiltration rates, at his farm.

Earlier on before engaging you, a college student had conducted an experiment where a field sample of an unconfined aquifer was packed in a cylinder (with length 60cm and diameter 8cm), the field sample was tested for 4 minutes under constant head difference of 15.3cm. Then 43.7cm³ of water was collected at the outlet and also determined the pore space as 55%. So based on your capabilities as a fresh graduate, clarify on the following to Mr. John Banes Chomba as your client:

- (a) Explain to your client why Irrigation is important in fruit and vegetable production. (4 marks)*
- (b) What kind of Irrigation System can you recommend to your client and why? (4 marks)*
- (c) With the aid of a well labelled illustration briefly explain the irrigation design system you have recommended and highlight the functions of its major components. (10 marks)*
- (d) What are the main advantages and disadvantages of the Irrigation System recommended in (b)? (5 marks)*
- (e) Briefly explain to your client the three major methods of determination of Soil texture on his farm? (6 marks).*
- (f) Based on the data generated by the earlier college student.*
 - (i) Determine the hydraulic conductivity of the aquifer sample? (6 marks).*
 - (ii) Compute the bulk density and comment on the implication of its value as regards to crop production? (5 marks)*

SECTION B: Answer any 4 Questions (out of the 6). Each question carries 15 marks

Question No. 2

Define the following terms, (from i to ii)

- (i) Cation Exchange Capacity (CEC) (2 marks)*
- (ii) Isomorphous Substitution (2 marks)*

- (iii) A soil from KMU contains 38% clay and has a CEC of 1.67 cmol (+)/kg soil. Calculate the CEC of the clay fraction assuming the measured CEC is due to clay only and state the probable clay type (6marks)
- (iv) A soil has a CEC of 15 cmol (+)/kg. Calculate the amount of exchangeable calcium (Ca^{2+}) it retains in kg/ha if the soil has a depth of 200mm and a bulk density of 1300 kg/m³? (5 marks)

Question No.3

- (i) Soil color is one property that can be used to describe horizonation and soil morphology. Discuss. (10 marks)
- (ii) State and define the 3 properties used to describe soil color using the Munsell system. (3marks)
- (iii) Give an example of a Munsell notation clearly indicating the properties stated in (i) above. (2marks)

Question No.4

Describe the roles of the *Dokuchaev's* soil forming factors in the formation of soils and their interrelationships. (15 marks)

Question No.5

- (i) Compare and contrast the *Matric Potential* (ψ_m) Vs *Osmotic Potential* (ψ_o) (5 marks)
- (ii) A meristematic plant tissue with a volume of 0.0008mm³ was placed in an open beaker of 0.4M sucrose at 25°C. What is the water potential of the solution in the beaker? (5 marks)
- (iii) If a plant tissue above has a water potential of -0.8 Mpa. Which way will the water move? How will this affect the cell? (5 marks)

QUESTION No.6

- (i) Briefly explain the mechanism of the Mycorrhiza Relationship? (5 marks)
- (ii) Discuss the functions of soil micro-organisms in relation to soil health and fertility. (10 marks)

QUESTION No.7

Define the following terms. (from i to ii)

- (i) Gravimetric Moisture Content (θ_g) (2 marks)
- (ii) Volumetric Moisture Content (θ_v) (2 marks)
- (iii) Calculate the porosity of a soil sample that has a bulk density of 1.35 g/cm^3 . Assume the particle density is 2.65 g/cm^3 . (6marks).
- (iv) Calculate the bulk density of a soil sample when $\frac{3}{4}$ of the pores are at saturation. (5marks)

-END OF EXAMINATION-



KAPASA MAKASA UNIVERSITY

DEPARTMENT OF AGRICULTURAL AND AQUATIC SCIENCES

BACHELOR OF SCIENCE IN AGRO-FORESTRY

BACHELOR OF SCIENCE IN SUSTAINABLE AGRICULTURE

2024 SESSIONAL EXAMINATION

COURSE NAME: PLANT PROTECTION

COURSE CODE: (NR 430, SA350)

TIME ALLOWED: 3 HOURS

DATE: 17TH OCTOBER, 2024

INSTRUCTIONS

- i. This question paper comprises of seven (7) questions
- ii. You are required to ATTEMPT a total of five (5) questions
- iii. Each question carries **20 marks**
- iv. Question 1 in SECTION A is **COMPULSORY**
- v. Choose 2 questions from SECTION B
- vi. Choose 2 questions from SECTION C
- vii. Clearly, write your Student Identity Number on the Answer Booklet provided
- viii. Write neatly and orderly to avoid loss of marks

SECTION A

QUESTION 1 (compulsory)

- (a) Insect taxonomy is a very important branch of science to agriculturalists as it deals with recognizing, describing and naming of species, and classification of such insects into a ranked system. State and in details describe seven (7) “*Orders*” into which insects can be classified including examples of insects that belong to such “*Orders*”. **(14 marks)**
- (b) In details, explain how bacteria reproduce and cause plant diseases. **(6 marks)**

SECTION B

QUESTION 2

- (a) Explain how plants defend themselves against infections using pre-existing defense structures **(12 marks)**
- (b) Define the following terms
- i. Stridulation
 - ii. Phytopathogenesis
 - iii. Conidia
 - iv. Phylogenetics **(8 marks)**

QUESTION 3

- (a) Explain how *Orientation and Recognition* of hosts takes place as a behavioural activity of insects before they establish themselves on the host plant **(10 marks)**
- (b) Nematodes are known to cause a number of problems and diseases in plants. Clearly, explain the damages caused by nematodes and how they cause such damages **(10 marks)**

QUESTION 4

- (a) In details, discuss plant disease tetrahedron (12 marks)
- (b) List various symptoms and signs caused by plant bacterial diseases (4 marks)
- (c) Explain in details how viruses invade the plant and cause diseases (4 marks)

SECTION C

QUESTION 5

- (a) Integrated Pest and Disease Management is based on six principles of plant disease management and it integrates multidisciplinary approaches for the management of plant diseases. Discuss (12 marks)
- (b) Briefly, explain how Polymerase Chain Reaction (PCR) works as a plant disease identification method (8 marks)

QUESTION 6

- (a) Weeds are known to cause tremendous damage in crop fields if not controlled. Discuss various levels of weed classification (12marks)
- (b) Briefly explain various characteristics of arthropods (8 marks)

QUESTION 7

- (a) Explain various cultural practices that aim at reducing the adverse effects of plant diseases (10 marks)
- (b) Biological control is among the methods used in weed management and control. Clearly, discuss the merits and demerits of this method. (10 marks)



THE COPPERBELT UNIVERSITY

KAPASA MAKASA UNIVERSITY

CHINSALI, MUCHINGA PROVINCE

CLIMATE CHANGE MITIGATION AND ADAPTATION - NR 450

END OF YEAR FINAL SESSIONAL EXAMINATION

23RD OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks **(20 Marks)**
4. Question one is **COMPULSORY**
5. Attempt a total of **FIVE** questions.

CELLPHONES AND OTHER RELATED GAGETS ARE NOT ALLOWED IN THE EXAMINATION ROOM

DO NOT TURN THIS PAGE UNTIL YOU HAVE BEEN TOLD TO DO SO BY THE CHIEF INVIGILATOR

QUESTION ONE

1. Answer the following questions:

- A. What is Climate Change? (5 marks)
- B. What is Resilience? (5 marks)
- C. What is the Paris Agreement? (5 marks)
- D. What is Disaster Risk Reduction? (5 marks)

QUESTION TWO

2. Using practical examples in Zambia, discuss the main causes of Climate Change? (20 marks)

QUESTION THREE

3. Using practical examples in Zambia, discuss the impacts of Climate Change on the Economic, Social and Environmental sectors. (20 marks)

QUESTION FOUR

4. Using practical examples in Zambia, discuss Climate Change Adaptation and Mitigation strategies in the Transport, Health, Economic and Environmental sectors. (20 marks)

QUESTION FIVE

5. Answer the following questions:

- A. What is Climate Change Adaptation? (4 marks)
- B. Discuss the following types of Adaptation:
 - i. Planned Adaptation (4 marks)
 - ii. Reactive Adaptation (4 marks)
 - iii. Private Adaptation (4 marks)
 - iv. Public Adaptation (4 marks)

QUESTION SIX

6. Answer the following questions:

- A. What is Climate Change Mitigation? (5 marks)
- B. Using practical examples in Zambia, discuss the role of forests in Climate Change Mitigation. (15 marks)

QUESTION SEVEN

7. The Sustainable Development Goal Number 13 focuses on Climate Action, as a student of Climate Change Mitigation and Adaptation discuss the following:

- A. What is Climate Action? (4 marks)
- B. In ways can you at individual level participate in Climate Action (6 marks)
- C. Discuss barriers youth experience when participating in Climate Action (10 marks)

END OF EXAMINATION, BEST WISHES.



THE COPPERBELT UNIVERSITY

KAPASA MAKASA UNIVERSITY

CHINSALI, MUCHINGA PROVINCE

EXTENSION AND RURAL SOCIOLOGY - NR 410

END OF YEAR FINAL SESSIONAL EXAMINATION

23RD OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks **(20 Marks)**
4. Question one is **COMPULSORY**
5. Attempt a total of **FIVE** questions.

CELLPHONES AND OTHER RELATED GAGETS ARE NOT ALLOWED IN THE EXAMINATION ROOM

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QUESTION ONE

1. Socialization is the process by which the new generation, young ones and even adults learn the knowledge, attitudes and values which they need to be responsible adults. Using practical examples, discuss the four agencies of socialization institutions. (20 marks)

QUESTION TWO

2. Various differences exist between rural and urban areas. Explain these differences in terms of population sizes, education sector, economic activities, social /physical infrastructure, and Administration/ leadership. (20 marks)

QUESTION THREE

3. Answer the following questions:
 - A. Define Extension Education. (5 marks)
 - B. Discuss the basic principles of Agriculture Extension. (5 marks)
 - C. Using practical examples, discuss the three main agriculture extension methods. (5 marks)
 - D. Using practical examples, discuss the challenges of extension service delivery in Zambia. (5 marks)

QUESTION FOUR

4. Answer the following questions:
 - A. Define Social Change. (4 marks)
 - B. Discuss the main facilitators of Social Change in rural societies. (8 marks)
 - C. Discuss the barriers to Social Change in rural societies. (8 marks)

QUESTION FIVE

5. Answer the following questions:
 - A. Define rural development and discuss the current problems in the social, environmental and economic sectors in rural areas of Zambia. (6 marks)
 - B. In your opinion, suggest how rural development in the social, environmental and economic sectors can be achieved in rural areas of Zambia? (6 marks)
 - C. Define sustainable development and discuss the three types of sustainability which include economic, social and environmental sustainability. (8 marks)

QUESTION SIX

6. What is Agroforestry and using examples discuss the four benefits of Agroforestry to both the farmers and the environment. **(20 marks)**

QUESTION SEVEN

7. As a student of Agroforestry, what are the effects of community members expanding into forest for their agricultural activities and what solutions can you provide to the farmers to stop expanding into the forest? **(20 marks)**

END OF EXAMINATION, BEST WISHES.



THE COPPERBELT UNIVERSITY
KAPASA MAKASA UNIVERSITY
CHINSALI, MUCHINGA PROVINCE
AGROFORESTRY SYSTEMS AND TECHNOLOGIES - NR 440
END OF YEAR FINAL SESSIONAL EXAMINATION

23RD OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks (**20 Marks**)
4. Question one is **COMPULSORY**
5. Attempt a total of **FIVE** questions.

CELLPHONES AND OTHER RELATED GAGETS ARE NOT ALLOWED IN THE EXAMINATION ROOM

DO NOT TURN THIS PAGE UNTIL YOU HAVE BEEN TOLD TO DO SO BY THE CHIEF INVIGILATOR

QUESTION ONE

1. Given the knowledge you have attained this far, kindly attempt any five of the following:

- A. How does agroforestry help in reducing soil erosion? (4 marks)
- B. What is silvopasture? (4 marks)
- C. Explain one way agroforestry contributes to carbon sequestration. (4 marks)
- D. Describe the term "alley cropping." (4 marks)
- E. How do nitrogen-fixing trees benefit agroforestry systems? (4 marks)
- F. What is one major economic benefit of agroforestry? (4 marks)

QUESTION TWO

2. What are the socio-economic benefits of agroforestry to smallholder farmers? Discuss the ways in which Agroforestry can improve food security and household income. (20 marks)

QUESTION THREE

3. Discuss the importance of agroforestry in climate change adaptation and mitigation. How do agroforestry systems help communities cope with the impacts of climate change? (20 marks)

QUESTION FOUR

4. Attempt all of the following:
- A. Briefly explain how agroforestry can improve biodiversity. (3 marks)
 - B. Why is agroforestry considered a sustainable farming practice? (3 marks)
 - C. What is the difference between micro and macro Diagnosis & Design in agroforestry? (2 marks)
 - D. Describe one challenge of implementing Agroforestry systems (2 marks)
 - E. How can agroforestry help mitigate climate change? (3 marks)
 - F. What are Multipurpose Tree species (MPTs)? List 3 commonly used MPTs and give their scientific names. (3 marks)
 - G. Distinguish between an Agroforestry system and Agroforestry technology? (2 marks)

H. What is the difference between monoculture and agroforestry? (2 marks)

QUESTION FIVE

5. What are the main challenges of implementing agroforestry systems on a larger scale? Discuss potential solutions to overcome these challenges. (20 marks)

QUESTION SIX

6. Explain the role of multipurpose tree species (MPTS) in agroforestry systems. Give 3 examples and discuss their benefits to both the environment and farmers. (20 marks)

QUESTION SEVEN

7. Explain the concept of Land Equivalent Ratio (LER) in agroforestry, and why it is used to compare productivity. Given the following data, calculate the LER for an agroforestry system consisting of maize and beans. In monoculture, maize yields 5 tons per hectare and pigeon pea yields 3 tons per hectare. In an intercropping agroforestry system, maize yields 3 tons per hectare, and pigeon pea yield 2 tons per hectare. Interpret your result. Explain what an LER value greater than or less than 1 means. (20 marks)

END OF EXAMINATION, BEST WISHES.

**SUSTAINABLE
AGRICULTURE
2025
YEAR 2 TO 4**



KAPASA MAKASA UNIVERSITY
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCE
END OF YEAR EXAMINATIONS
2024/2025 ACADEMIC YEAR

AA200/NR200 : BIOMETRY

Thursday, 13th November 2025 : 09 : 00 – 12 : 00

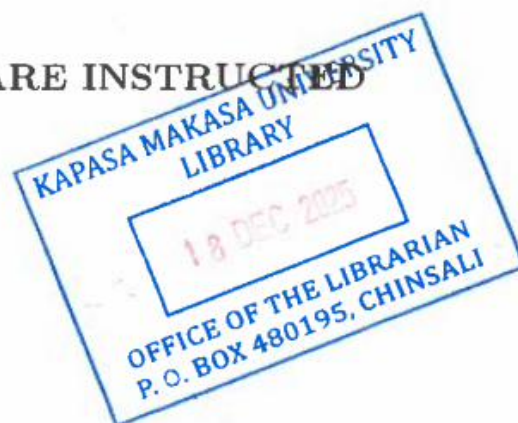
Time Allowed: 3 hours

Total Marks: 100

Instructions

1. Indicate your **computer number** on all your answer booklets.
2. There are **Two** sections in this examination paper. The question in **Section A** is compulsory and in **Section B** attempt **any three (3)** questions.
3. All questions carry equal marks. Mark allocations are shown in brackets.
4. **Full credit** will only be given when **all necessary working** is shown.
5. Use of scientific, non-programmable **calculators** is **allowed**.
6. Use of smartphones, smartwatches, or any other electronic devices capable of communication, calculation, or data storage is **strictly prohibited**.

DO NOT TURN OVER UNTIL YOU ARE INSTRUCTED



Section A

1. (a) Distinguish the following terms used in Biometry.

- (i) Biometry and Statistics [2]
- (ii) Descriptive and Inferential statistics [2]
- (iii) Quantitative and Qualitative data [2]

- (b) The following data represent the yields (in tons per hectare) of a specific crop collected from various agricultural fields during a regional field survey:

12.4 17.8 14.2 20.6 11.3 16.9 18.5 22.7 28.4 19.6 23.5 25.0
30.2 13.1 17.4 21.9 24.3 27.8 29.1 10.7 15.9 18.2 26.6 34.0
19.8 15.3 20.4 25.7 31.3 33.5 32.1 14.6 11.9 16.2 21.1 23.8
28.9 29.4 24.0 30.8

- (i) Create a cumulative distribution table using class intervals of width 4, starting with a lower limit of 10.0. [8]

- (ii) Construct a frequency polygon. [3]

- (iii) Construct an Ogive [3]

- (c) A researcher collected data on the weight (in kilograms) of maize harvest from 12 small-holder farms. The following summary statistics were obtained:

$$\sum_{i=1}^{12} x_i = 960 \quad \text{and} \quad \sum_{i=1}^{12} x_i^2 = 82,560$$

Using this information, calculate the following.

- (i) The mean harvest weight per farm. [2]
- (ii) The variance of the harvest weights. [3]

Section B

2. (a) Show that for a sample $x_1, x_2, \dots, x_n$, the sample variance

$$\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2 = \frac{1}{n-1} \left(\sum_{i=1}^n x_i^2 - n\bar{x}^2 \right)$$

[4]

- (b) A total of 50 fish farmers participated in a training workshop. As part of a skills assessment, they were tested on their ability to correctly grade Tilapia. The number of fish each farmer correctly graded in a 5-minute period is shown below along with their frequencies.



Fish Graded Correctly Number of Farmers (Frequency)

10	3
15	6
20	10
25	15
30	9
35	5
40	2



Find the following:

- (i) The mean number of fish correctly graded. [4]
- (ii) The median number of fish correctly graded. [3]
- (iii) The standard deviation of the number of fish graded. [5]
- (c) The following data represents the daily water requirements (in liters) for 30 different small-scale irrigation plots recorded during one growing season:

25 32 28 30 27 35 40 33 31 29
 34 36 38 41 37 26 24 39 43 45
 22 23 21 44 42 20 19 18 17 46

- (i) Find the **Interquartile Range (IQR)** [5]
- (ii) Find the **25th percentile** [4]
- 3. (a) Distinguish the following terms used in Probability.
 - (i) Mutually exclusive and Non mutually exclusive events [2]
 - (ii) Statistically dependent and independent events [2]
 - (iii) Discrete random variable and Continuous random variable [2]
- (b) At a large grain cooperative, the moisture content of a randomly selected batch of wheat is normally distributed with a mean of 14.5% and a standard deviation of 2.2%. This is a critical measure, as high moisture can lead to spoilage during storage.

Determine the probability that a randomly selected batch of wheat will have a moisture content that is:

- (i) Between 13% and 16%. [4]
- (ii) Between 17% and 19%. [4]
- (iii) Below 12%. [2]

(iv) To prevent spoilage, batches in the highest 5% of moisture content must be dried before storage. What is the minimum moisture content that requires a batch to be dried? [5]

(c) A study was conducted on the monthly fertilizer usage for a sample of 80 small-scale maize farms. The average fertilizer usage for the sample is 420 kg per month. Assuming the standard deviation of fertilizer usage for all farms is 50 kg, construct a 95% confidence interval estimate of the actual mean fertilizer usage. [4]

4. (a) A grain storage facility has observed that trucks delivering maize arrive randomly at an average rate of 30 trucks per hour. Calculate the probability that:

(i) only 2 trucks will arrive during a specified 1-hour period [2]

(ii) at least 3 trucks will arrive during a specified 30-minute period. [5]

(b) A study is conducted to compare maize yields under two different sustainable farming practices: **Conservation Tillage (CT)** and **Organic Farming (OF)**. A random sample of 60 farms using CT records an average yield of **4.8 tons per hectare** with a known population standard deviation of **0.6 tons**, while 55 farms using OF record an average yield of **4.5 tons per hectare** with a known population standard deviation of **0.5 tons**. At the 5% level of significance, test whether the average maize yields are the same under the two farming practices. [8]

(c) A study was conducted on 9 different commercial tomato farms to investigate the relationship between the amount of fertilizer applied and the resulting crop yield. The data collected are shown below:

Farm	Fertilizer Applied (kg/ha)	Tomato Yield (tons/ha)
1	50	12.5
2	200	28.0
3	100	22.0
4	150	26.5
5	250	29.0
6	75	18.0
7	175	27.5
8	125	24.0
9	225	30.5

(i) Identify which variable is the dependent variable and why? [2]

(ii) Calculate the Pearson correlation coefficient and interpret. [8]

5. (a) A survey was conducted among students in the School of Agricultural Sciences at Kapasa Makasa University. The students were classified by their *field of specialization* and by *gender*. The results are shown below:

Field of Specialization	Male	Female	Total
Crop Science (CS)	18	22	40
Animal Production (AP)	20	15	35
Fisheries Management (FM)	25	30	55
Total	63	67	130



If one student is chosen at random from this group, find:

- (i) $P(\text{Female})$ [2]
 - (ii) $P(\text{Male} \cap \text{Crop Science})$ [2]
 - (iii) $P(\text{Fisheries Management} \mid \text{Female})$ [3]
- (b) A nutritionist claims that a certain breed of goats produces an average of **2.5 liters of milk per day**. A random sample of 12 goats produces a mean of **2.8 liters/day** with a sample standard deviation of **0.4 liters**. Using a 5% significance level, test whether the average daily milk production differs from the claimed 2.5 liters. [6]
- (c) A researcher recorded the **amount of fertilizer applied (kg/ha)** and the corresponding **maize yield (tons/ha)** from eight experimental plots, as shown below:

Fertilizer (kg/ha)	0	20	40	60	80	100	120	140
Maize yield (t/ha)	1.2	1.8	2.3	2.6	3.0	3.3	3.5	3.6

- (i) Identify independent variable [1]
 - (ii) Construct a **scatter plot** of maize yield against fertilizer rate. [3]
 - (iii) Determine the **linear regression equation** that best fits the data. [7]
 - (iv) Using the regression line, **estimate the expected maize yield** when 50 kg/ha of fertilizer is applied. [1]
6. (a) Define the following terms used in Biometry
- (i) Variable [1]
 - (ii) Sample [1]
- (b) A commercial farming company has observed that only 30% of job applicants for farm machinery operation are fully qualified. If 6 applicants are interviewed, let X be the number of qualified applicants.

Find the following probabilities:

(i) $P(X = 1)$

(ii) $P(X \geq 3)$

[3,5]

- (c) A livestock nutritionist conducted an experiment to compare the average daily weight gain (in kg) of lambs fed four different dietary supplements (Supplement P, Q, R, and S). The weight gains over a 30-day trial period are shown below:

Here's the table with totals for each group added:

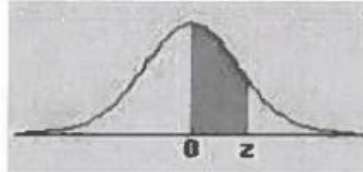
Supplement P	Supplement Q	Supplement R	Supplement S
0.8	1.2	1.5	1.0
0.9	1.1	1.4	0.9
0.7	1.3	1.6	1.1
1.0	1.0	1.3	0.8
0.8			1.2
Total: 4.2	Total: 4.6	Total: 5.8	Total: 5.0

- (i) State three assumptions assumed to carry out analysis of variance [3]

- (ii) Test the hypothesis that there is no significant difference in the mean daily weight gain among the four supplements at $\alpha = 0.05$ level of significance. [12]

END OF EXAMINATION PAPER!

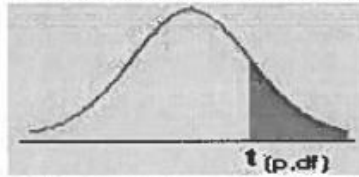
TABLE 1: THE STANDARD NORMAL DISTRIBUTION



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CHINGALI

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990

TABLE 2: THE T-DISTRIBUTION



df/p	0.40	0.25	0.10	0.05	0.025	0.01	0.005	0.0005
1	0.324920	1.000000	3.077684	6.313752	12.70620	31.82052	63.65674	636.6192
2	0.288675	0.816497	1.885618	2.919986	4.30265	6.96456	9.92484	31.5991
3	0.276671	0.764892	1.637744	2.353363	3.18245	4.54070	5.84091	12.9240
4	0.270722	0.740697	1.533206	2.131847	2.77645	3.74695	4.60409	8.6103
5	0.267181	0.726687	1.475884	2.015048	2.57058	3.36493	4.03214	6.8688
6	0.264835	0.717558	1.439756	1.943180	2.44691	3.14267	3.70743	5.9588
7	0.263167	0.711142	1.414924	1.894579	2.36462	2.99795	3.49948	5.4079
8	0.261921	0.706387	1.396815	1.859548	2.30600	2.89646	3.35539	5.0413
9	0.260955	0.702722	1.383029	1.833113	2.26216	2.82144	3.24984	4.7809
10	0.260185	0.699812	1.372184	1.812461	2.22814	2.76377	3.16927	4.5869
11	0.259556	0.697445	1.363430	1.795885	2.20099	2.71808	3.10581	4.4370
12	0.259033	0.695483	1.356217	1.782288	2.17881	2.68100	3.05454	4.3178
13	0.258591	0.693829	1.350171	1.770933	2.16037	2.65031	3.01228	4.2208
14	0.258213	0.692417	1.345030	1.761310	2.14479	2.62449	2.97684	4.1405
15	0.257885	0.691197	1.340606	1.753050	2.13145	2.60248	2.94671	4.0728
16	0.257599	0.690132	1.336757	1.745884	2.11991	2.58349	2.92078	4.0150
17	0.257347	0.689195	1.333379	1.739607	2.10982	2.56693	2.89823	3.9651
18	0.257123	0.688364	1.330391	1.734064	2.10092	2.55238	2.87844	3.9216
19	0.256923	0.687621	1.327728	1.729133	2.09302	2.53948	2.86093	3.8834
20	0.256743	0.686954	1.325341	1.724718	2.08596	2.52798	2.84534	3.8495
21	0.256580	0.686352	1.323188	1.720743	2.07961	2.51765	2.83136	3.8193
22	0.256432	0.685805	1.321237	1.717144	2.07387	2.50832	2.81876	3.7921
23	0.256297	0.685306	1.319460	1.713872	2.06866	2.49987	2.80734	3.7676
24	0.256173	0.684850	1.317836	1.710882	2.06390	2.49216	2.79694	3.7454
25	0.256060	0.684430	1.316345	1.708141	2.05954	2.48511	2.78744	3.7251
26	0.255955	0.684043	1.314972	1.705618	2.05553	2.47863	2.77871	3.7066
27	0.255858	0.683685	1.313703	1.703288	2.05183	2.47266	2.77068	3.6896
28	0.255768	0.683353	1.312527	1.701131	2.04841	2.46714	2.76326	3.6739
29	0.255684	0.683044	1.311434	1.699127	2.04523	2.46202	2.75639	3.6594
30	0.255605	0.682756	1.310415	1.697261	2.04227	2.45726	2.75000	3.6460
inf	0.253347	0.674490	1.281552	1.644854	1.95996	2.32635	2.57583	3.2905

TABLE A.3

F Distribution: Critical Values of F (5% significance level)

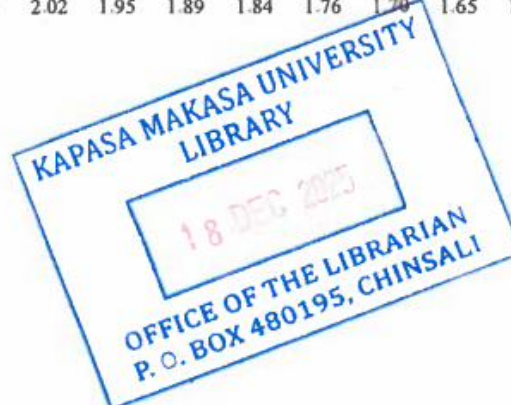
v_1	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20
v_2															
1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54	241.88	243.91	245.36	246.46	247.32	248.01
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.42	19.43	19.44	19.45
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.71	8.69	8.67	8.66
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.87	5.84	5.82	5.80
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.64	4.60	4.58	4.56
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.96	3.92	3.90	3.87
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.53	3.49	3.47	3.44
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.24	3.20	3.17	3.15
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.03	2.99	2.96	2.94
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.86	2.83	2.80	2.77
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.74	2.70	2.67	2.65
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.64	2.60	2.57	2.54
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.55	2.51	2.48	2.46
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.48	2.44	2.41	2.39
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.42	2.38	2.35	2.33
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.37	2.33	2.30	2.28
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.33	2.29	2.26	2.23
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.29	2.25	2.22	2.19
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.26	2.21	2.18	2.16
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.22	2.18	2.15	2.12
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.20	2.16	2.12	2.10
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.17	2.13	2.10	2.07
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.15	2.11	2.08	2.05
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.13	2.09	2.05	2.03
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.11	2.07	2.04	2.01
26	4.22	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.15	2.09	2.05	2.02	1.99
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.13	2.08	2.04	2.00	1.97
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19	2.12	2.06	2.02	1.99	1.96
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.10	2.05	2.01	1.97	1.94
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.04	1.99	1.96	1.93
35	4.12	3.27	2.87	2.64	2.49	2.37	2.29	2.22	2.16	2.11	2.04	1.99	1.94	1.91	1.88
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.95	1.90	1.87	1.84
50	4.03	3.18	2.79	2.56	2.40	2.29	2.20	2.13	2.07	2.03	1.95	1.89	1.85	1.81	1.78
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.86	1.82	1.78	1.75
70	3.98	3.13	2.74	2.50	2.35	2.23	2.14	2.07	2.02	1.97	1.89	1.84	1.79	1.75	1.72
80	3.96	3.11	2.72	2.49	2.33	2.21	2.13	2.06	2.00	1.95	1.88	1.82	1.77	1.73	1.70
90	3.95	3.10	2.71	2.47	2.32	2.20	2.11	2.04	1.99	1.94	1.86	1.80	1.76	1.72	1.69
100	3.94	3.09	2.70	2.46	2.31	2.19	2.10	2.03	1.97	1.93	1.85	1.79	1.75	1.71	1.68
120	3.92	3.07	2.68	2.45	2.29	2.18	2.09	2.02	1.96	1.91	1.83	1.78	1.73	1.69	1.66
150	3.90	3.06	2.66	2.43	2.27	2.16	2.07	2.00	1.94	1.89	1.82	1.76	1.71	1.67	1.64
200	3.89	3.04	2.65	2.42	2.26	2.14	2.06	1.98	1.93	1.88	1.80	1.74	1.69	1.66	1.62
250	3.88	3.03	2.64	2.41	2.25	2.13	2.05	1.98	1.92	1.87	1.79	1.73	1.68	1.65	1.61
300	3.87	3.03	2.63	2.40	2.24	2.13	2.04	1.97	1.91	1.86	1.78	1.72	1.68	1.64	1.61
400	3.86	3.02	2.63	2.39	2.24	2.12	2.03	1.96	1.90	1.85	1.78	1.72	1.67	1.63	1.60
500	3.86	3.01	2.62	2.39	2.23	2.12	2.03	1.96	1.90	1.85	1.77	1.71	1.66	1.62	1.59
600	3.86	3.01	2.62	2.39	2.23	2.11	2.02	1.95	1.90	1.85	1.77	1.71	1.66	1.62	1.59
750	3.85	3.01	2.62	2.38	2.23	2.11	2.02	1.95	1.89	1.84	1.77	1.70	1.66	1.62	1.58
1000	3.85	3.00	2.61	2.38	2.22	2.11	2.02	1.95	1.89	1.84	1.76	1.70	1.65	1.61	1.58



TABLE A.3

F Distribution: Critical Values of F (5% significance level)

ν_1	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20
ν_2															
1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54	241.88	243.91	245.36	246.46	247.32	248.01
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.42	19.43	19.44	19.45
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.71	8.69	8.67	8.66
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.87	5.84	5.82	5.80
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.64	4.60	4.58	4.56
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.96	3.92	3.90	3.87
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.53	3.49	3.47	3.44
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.24	3.20	3.17	3.15
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.03	2.99	2.96	2.94
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.86	2.83	2.80	2.77
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.74	2.70	2.67	2.65
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.64	2.60	2.57	2.54
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.55	2.51	2.48	2.46
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.48	2.44	2.41	2.39
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.42	2.38	2.35	2.33
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.37	2.33	2.30	2.28
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.33	2.29	2.26	2.23
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.29	2.25	2.22	2.19
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.26	2.21	2.18	2.16
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.22	2.18	2.15	2.12
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.20	2.16	2.12	2.10
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.17	2.13	2.10	2.07
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.15	2.11	2.08	2.05
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.13	2.09	2.05	2.03
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.11	2.07	2.04	2.01
26	4.22	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.15	2.09	2.05	2.02	1.99
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.13	2.08	2.04	2.00	1.97
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19	2.12	2.06	2.02	1.99	1.96
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.10	2.05	2.01	1.97	1.94
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.04	1.99	1.96	1.93
35	4.12	3.27	2.87	2.64	2.49	2.37	2.29	2.22	2.16	2.11	2.04	1.99	1.94	1.91	1.88
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.95	1.90	1.87	1.84
50	4.03	3.18	2.79	2.56	2.40	2.29	2.20	2.13	2.07	2.03	1.95	1.89	1.85	1.81	1.78
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.86	1.82	1.78	1.75
70	3.98	3.13	2.74	2.50	2.35	2.23	2.14	2.07	2.02	1.97	1.89	1.84	1.79	1.75	1.72
80	3.96	3.11	2.72	2.49	2.33	2.21	2.13	2.06	2.00	1.95	1.88	1.82	1.77	1.73	1.70
90	3.95	3.10	2.71	2.47	2.32	2.20	2.11	2.04	1.99	1.94	1.86	1.80	1.76	1.72	1.69
100	3.94	3.09	2.70	2.46	2.31	2.19	2.10	2.03	1.97	1.93	1.85	1.79	1.75	1.71	1.68
120	3.92	3.07	2.68	2.45	2.29	2.18	2.09	2.02	1.96	1.91	1.83	1.78	1.73	1.69	1.66
150	3.90	3.06	2.66	2.43	2.27	2.16	2.07	2.00	1.94	1.89	1.82	1.76	1.71	1.67	1.64
200	3.89	3.04	2.65	2.42	2.26	2.14	2.06	1.98	1.93	1.88	1.80	1.74	1.69	1.66	1.62
250	3.88	3.03	2.64	2.41	2.25	2.13	2.05	1.98	1.92	1.87	1.79	1.73	1.68	1.65	1.61
300	3.87	3.03	2.63	2.40	2.24	2.13	2.04	1.97	1.91	1.86	1.78	1.72	1.68	1.64	1.61
400	3.86	3.02	2.63	2.39	2.24	2.12	2.03	1.96	1.90	1.85	1.78	1.72	1.67	1.63	1.60
500	3.86	3.01	2.62	2.39	2.23	2.12	2.03	1.96	1.90	1.85	1.77	1.71	1.66	1.62	1.59
600	3.86	3.01	2.62	2.39	2.23	2.11	2.02	1.95	1.90	1.85	1.77	1.71	1.66	1.62	1.59
750	3.85	3.01	2.62	2.38	2.23	2.11	2.02	1.95	1.89	1.84	1.77	1.70	1.66	1.62	1.58
1000	3.85	3.00	2.61	2.38	2.22	2.11	2.02	1.95	1.89	1.84	1.76	1.70	1.65	1.61	1.58





KAPASA MAKASA UNIVERSITY

SCHOOL OF APPLIED SCIENCES

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

21ST OCTOBER, 2025

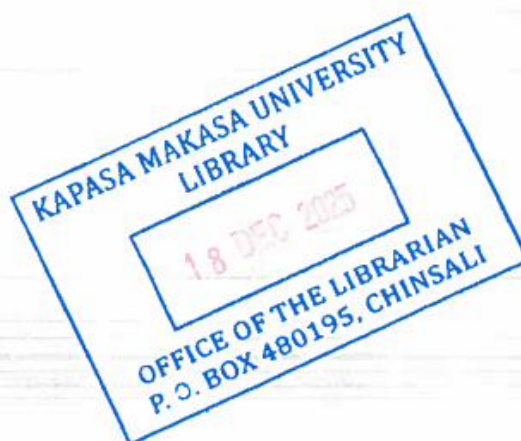
14:00-17:00

BOTANY

SA 200

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory (CQ) in **Section A**
3. Answer any four (4) questions out of six in **Section B**
4. There are 100 marks allocated to this paper
5. Each question carries **20 marks**
6. Where possible, illustrate your answers
7. Time allowed: **Three 3 hours**
8. When answering follow further instructions in the answer book
9. Using any unauthorized document in the exam room is prohibited





SECTION A: - Compulsory

QUESTION ONE

- a. Name and describe the main parts of the flower. (4 marks)
- b. Highlight the salient features of International Code of Botanical Nomenclature (8 marks)
- c. Describe the structure of the xylem tissue. (4 marks)
- d. What limitations do bryophytes face in terms of growth and distribution? (4 marks)

SECTION B- Choose any 4 questions

QUESTION 2.

- a. Name three methods of seed dispersal and provide a brief description of each. (6 marks)
- b. Explain why it is important to understand the plant taxonomy hierarchy? (4 Marks)
- c. State the main function of the vascular bundles found in the pteridophytes? (4 Marks).
- d. State the factors that affects transpiration. (6 Marks).

QUESTION 3.

Simple permanent tissues are essential components of plant structure and functions. In your answer address the following;

Define the term simple permanent tissues and describe the main types of simple permanent tissues found in plants and their functions. (20 Marks)

QUESTION 4

Describe the plant division spermatophyte, including its characteristics and sub-divisions. Provide examples of plants that belong to each sub-division. (20 Marks)

QUESTION 5.

Describe the process of photosynthesis and its significance to life. (20 Marks)

QUESTION 6.

Discuss the role of plant hormones in regulating growth development, include examples of key hormones and their functions. (20 Marks)

QUESTION 7.

Discuss the importance of botany in addressing global challenges such as food security, environmental conservation and human health. (20 Marks).





KAPASA MAKASA UNIVERSITY
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

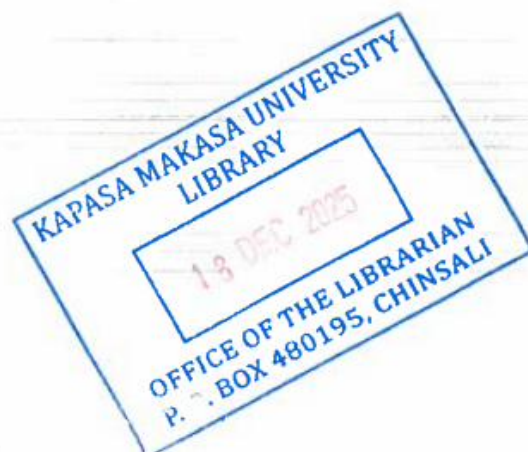
5TH NOVEMBER, 2025

09:00-12:00

COURSE: ECOLOGY

CODE: SA 210

TIME ALLOWED: 3 HOURS



INSTRUCTIONS

- i. This question paper comprises of seven (7) questions
- ii. You are required to ATTEMPT a total of five (5) questions
- iii. Each question carries **20 marks**
- iv. Question 1 in SECTION A is **COMPULSORY**
- v. Choose 4 questions from SECTION B
- vi. Using any foreign material in an exam is prohibited

SECTION A- Compulsory

QUESTION 1

- a. In most terrestrial biotic communities' certain plants comprise the dominant role because not only do they provide food and shelter for other organisms but also directly affect and modify their physical environment. In details, explain the ways in which this physical modification takes place. (10 marks)
- b. The studies of the ecosystems have revealed abiotic factors can limit performance of species in an ecosystem when they exist too much or little. Elaborate (10 marks)

SECTION B- Choose any 4 questions

QUESTION 2

Describe the flow of energy through an ecosystem, beginning with primary producers and ending with decomposers. Further, discuss how energy flow differs from nutrient cycling?

[20 marks]

QUESTION 3

Describe the carbon cycle, emphasizing the processes of photosynthesis and respiration. How does the carbon cycle maintain a balance in the Earth's ecosystems, and how is this balance currently being disrupted by human activities? [20 marks]

QUESTION 4

- a. Discuss density-dependent and density-independent factors that regulate population size. Provide examples of each and explain how these factors can influence population stability and growth. [15 marks]
- b. With at least 2 examples, discuss various characteristics of k-strategists species. (5 marks)

QUESTION 5

- a. Draw and explain all the processes involved in nitrogen cycle. Further, explain its importance. (10 marks)
- b. In details, explain food chain and food web. (5 marks)



QUESTION 6

Discuss the significance of biodiversity in maintaining the stability and resilience of ecosystems. How do human activities threaten biodiversity, and what are the potential consequences of reduced biodiversity? [20 marks]

QUESTION 7

Draw and in details explain the water cycle. [20 marks]





KAPASA MAKASA UNIVERSITY

SCHOOL OF APPLIED SCIENCES

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

29TH OCTOBER, 2025

09:00-12:00

AQUACULTURE AND APICULTURE

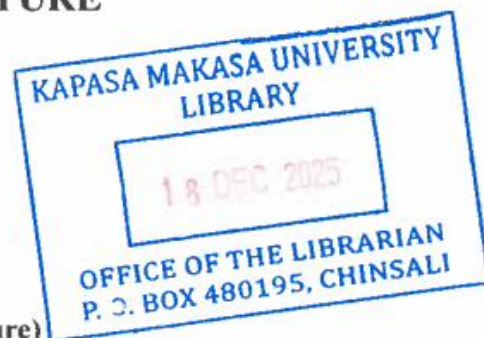
SA 220

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory Question in **Section A**
3. Answer any Two (2) questions out of 3 in **Section B (Aquaculture)**
4. Answer any Two (2) questions out of 3 in **Section C (Apiculture)**
5. Use **TWO** different answer booklets, 1 for economics and another for Entrepreneurship section
6. There are 100 marks allocated to this paper
7. Each question carries **20 marks**
8. Where possible, illustrate your answers
9. Time allowed: **Three 3 hours**

1. Cell Phones are NOT allowed in the Examination Room.

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO



SECTION A

QUESTION ONE – A (Aquaculture-compulsory)

During your training in the aquaculture course (SA220), you undertook a visit to Kapasa Makasa University (KMU) Fish Farm as a way of exposure and solidifying the theoretical concepts that you learnt in class. As such, the following questions are based on the that visit to the farm and some concepts learnt in class.

- a) What type of culture facilities were found at the farm? [1 Mark]
- b) Using Scientific names, mention any two species of fish cultured at KMU. [2 Marks]
- c) What is aquaculture biosecurity? [2 Marks]
- d) State two measures of biosecurity found at the farm [2 Mark]
- e) What form of value addition is done or may be done at the farm? [1 Mark]
- f) If you are asked to improve biosecurity measures at the farm, what two things would you implement? [2 Marks]

QUESTION ONE-B (Apiculture- compulsory)

- (a) Define marketing in the context of apiculture [2 marks]
- (b) Explain with examples the **4Ps** of marketing bee products making reference to the local context [8 marks]

SECTION B- AQUACULTURE (Choose any 2 questions)

QUESTION TWO

- a) Define the following terms
 - i. Disease [1 Marks]
 - ii. Aquaculture [1 Marks]
 - iii. Exophthalmus [1 Marks]
- b) Why is it important from an aquaculture perspective to know or study reproductive diversity. [1 Marks]
- c) Explain briefly what would happen if one of the nodes of the aquaculture value chain is poorly operated or executed. [2 Marks]



- d) List two disease causing organisms in fish and for each provide an example of a disease that is caused by the pathogens. **[4 Marks]**
- e) In reference to Table 1, Calculate the Feed Conversion Ratio (FCR) for the three species and suggest which one of the three species would not make a better species for farming and why. **[10 marks]**

Table 1: Data about three fish species

FISH SPECIES	QUANTITY OF ADMINISTERED (G)	FEED WEIGHT GAINED (G)
<i>Labrus bergylta</i>	4.8	3.1
<i>Lates calcarifer</i>	5.2	2
<i>Cyprinus carpio</i>	10.7	9.7

QUESTION THREE

- a) Differentiate the following terms
- Fish and Fishes **[2 Marks]**
 - Zooplankton and phytoplankton **[2 Marks]**
 - Semi-intensive and intensive aquaculture **[2 Marks]**
- b) In aquaculture, understanding puberty of your fish species is critical because both Early and Late puberty can be a problem. With examples, discuss the previous statement **[4 Marks]**
- c) You have been approached by a prospective fish farmer who wants to engage in fish farming using Recirculating Aquaculture system (RAS). You are asked to provide two merits and demerits of RAS to help the prospective fish farmers an informed decision. **[4 Marks]**
- d) Nutritional requirements for fish vary from species to species and or fish to fish. Explain two (2) factors that affect nutritional requirements of fish. **[4 Marks]**
- e) In order to operate a fish hatchery, having quality and quantity broodstock is paramount. List any two sources of quality broodstock for hatcheries. **[2 Marks]**



QUESTION FOUR

a) Define the following terms

- | | |
|-----------------|-----------|
| i. Entrepreneur | [1 Mark] |
| ii. Aquaponics | [1 Mark] |
| iii. Broodstock | [1 Mark] |

b) Discuss fish rice integration system as a production facility. (5 Marks)

c) Imagine that you've graduated from KMU and you are employed as a farm manager at GPS Farms in Mbala district. You are tasked to construct five fish ponds. Briefly discuss three key factors you would consider when selecting an ideal or appropriate site for ponds construction. [3 marks]

d) You have been employed as an extension Officer and a women's Cooperative invites you to train them on fish feed formulation. You have been provided with Fish Meal (FM) and Maize Bran (MB) having 60% and 13% Protein, respectively and the species for which this On-Farm feed is to be formulated requires at least 25% Protein. Using Pearson Squire Method, calculate the quantities of each ingredient required if you are to prepare five (5) tonnes of feed. [5 marks]

e. Discuss any four (4) Ps marketing mix [4 Marks]

SECTION C- APICULTURE (Choose any 2 questions)

QUESTION FIVE

- (a) Describe using examples and illustrations the communication phenomenon in bees being social insects [10 marks]
- (b) State Ten (10) beekeeping protective clothing/basic equipment that are essential when venturing into beekeeping [10 marks]

QUESTION SIX



Justify the need for beekeeping by giving **Ten (10)** points giving reference to the Zambian context. (20 Marks)

QUESTION SEVEN

- (a) Explain briefly the many stages involved in the honey making process by bees [10 marks]
- (b) Using the rules of taxonomy and nomenclature, State **Five (5)** important bee forage species that need to be within the vicinity for prime honey production.
[10 marks]

THE END





KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCES AND OPEN LEARNING
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES
BACHELOR OF SCIENCE DEGREE
AA210/NR230 – REMOTE SENSING AND GIS

SESSIONAL EXAMINATION

DATE: 7 NOVEMBER 2025

TIME: THREE (3) HOURS

INSTRUCTIONS

- (a) Write your Student Identification Number on the Answer Booklet provided.
- (b) There are two sections in this paper (A and B). **Section A** has one compulsory question.
- (c) Choose any four (4) questions from **section B**.
- (d) Start **each** answer on a new page.
- (e) No unauthorized materials are allowed.
- (f) Write clearly and legibly.



DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO.



SECTION A

Question One (Compulsory)

- a) A blackbody has a temperature of 7000 K. Using the Stefan-Boltzmann Law, calculate the total radiant energy emitted by the blackbody per unit area. (2 marks)
- b) The Planet Mercury has a blackbody temperature of approximately 440 K. Calculate the dominant wavelength of the Mercury's radiation. (2 marks)
- c) A photon has a wavelength of 0.2 μm . Calculate the energy of this photon using Planck's equation. (2 marks)
- d) An electromagnetic wave has a frequency of 12×10^{14} Hz. Calculate its wavelength in micrometer(μm). (2 marks)
- e) A sensor measures a radiant flux density of 600 W/m^2 from a blackbody. If the blackbody's temperature is 400 K, verify whether this measurement is consistent with the Stefan-Boltzmann Law. (2 marks)
- f) Earth has an average blackbody temperature of 300 K. Using Wien's Displacement Law, calculate the dominant wavelength of Earth's emitted radiation. (2 marks)
- g) Compare the energy of two photons: one with a wavelength of 0.1 μm (ultraviolet) and another with a wavelength of 0.8 μm (red light). Which photon has higher energy, and by how much? (6 marks)
- h) The surface of a star emits radiation with a dominant wavelength of 400 nm. Using Wien's Displacement Law, estimate the surface temperature of the star in Kelvins. (2 marks)



SECTION B

Question Two

List and discuss the four main types of image resolutions used in remote sensing. Explain the significance of each type of resolution in the context of remote sensing applications and give examples to illustrate your answers **(20 marks)**

Question Three

You have just finished performing a landuse classification and below is the confusion matrix that will help you validate your work. Show your working.

Classification Data	Urban	Forest	Agriculture	Bareland	Row Total
Urban	50	4	2	1	57
Forest	5	80	8	5	98
Agriculture	3	6	70	4	83
Bareland	2	10	10	40	62
Column Total	60	100	90	50	300

- Calculate the producer's accuracy for each class (Urban, Forest, Agriculture, Bareland). **(4 mark)**
- Calculate the user's accuracy for each class (Urban, Forest, Agriculture, Bareland). **(4 mark)**
- Calculate the omission error (%) for each class. **(4 mark)**
- Calculate the commission error (%) for each class. **(4 mark)**
- Compute the overall classification accuracy for the map. **(2 marks)**
- Identify which class has the highest omission error and give a one-sentence plausible explanation. **(2 marks)**

Question Four

You are provided with a Landsat 8 satellite image covering **Sumbu National Park in Zambia** and a shapefile of the park boundary. Using your knowledge of remote sensing and GIS operations in **ArcGIS**, answer the following questions.

- Explain the step-by-step process of computing the Normalized Difference Vegetation Index (NDVI) from the Landsat 8 image in ArcGIS. **(5 marks)**
- Describe how you would clip the NDVI raster to the park boundary in ArcGIS and explain the purpose of this step. **(3 marks)**

c) NDVI values are commonly classified into vegetation density ranges. Based on the following NDVI ranges:

- <0.1, 0.1–0.3, 0.3–0.5, 0.5–0.7, and >0.7
Explain what each class represents in terms of vegetation condition.
(3 marks)

d) A CSV file containing GPS coordinates of sample points has been provided. Change the points to decimal degrees (DD) format. 1: 12° 13' 51" S, 32° 05' 48" E; 2: 11° 57' 59" S, 32° 09' 55" E; 3: 11° 57' 45" S, 31° 51' 09" E 4: 12° 34' 37" S, 32° 45' 56" E; 5: 12° 48' 07" S, 32° 34' 58" E (5 marks)

e) When preparing the final NDVI map layout in ArcGIS, list and describe four essential cartographic elements that should be included to make the map professional and readable. (4 marks)

Question Five

- a) Define the following terms related to the interaction of Electromagnetic Radiation (EMR) with the atmosphere:
1. Absorption (2 marks)
 2. Scattering (2 marks)
 3. Refraction (1 marks)
- b) Discuss the various types of scattering that occur when Electromagnetic Radiation (EMR) interacts with the atmosphere. Provide examples to illustrate each type of scattering. (15 marks)

Question Six

- a) Define *Remote Sensing* and explain how it differs from direct ground observation. (5 marks)
- b) Describe the two main types of remote sensing systems based on energy source, giving one example for each. (6 marks)
- c) Define *satellite orbit* and briefly describe any two types of satellite orbits used in Earth observation. (6 marks)
- d) Explain the term *spatial resolution* and why it is important in satellite image interpretation. (3 marks)



Question Seven

- a) Define the Normalized Difference Red Edge Index (**NDRE**) and state its formula. **(5 marks)**
- b) Explain how **NDRE** differs from **NDVI** and when it should be used. **(7 marks)**
- c) Define the Modified Soil Adjusted Vegetation Index (**MSAVI**) and explain why it is preferred at early growth stages. **(5 marks)**
- d) Briefly discuss one advantage of combining NDVI and NDRE in crop monitoring. **(3 marks)**

THE END

“Whether you think you can, or you think you can’t - you are right”

Good luck!



Formulae

Speed of light

$$c = \lambda \nu$$

C = constant speed of light (3×10^8 m/s)

λ = Wavelength

ν = frequency

Stefan-Boltzman Law

$$M_{\lambda} = \sigma T^4$$

M_{λ} = total emitted radiation from a blackbody (W m^{-2})

σ = Stefan-Boltzmann constant ($5.6697 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$)

T = absolute temperature (degrees Kelvin)

Wien's Displacement Law

$$\lambda_{\max} = k/T$$

$\lambda_{\max}$ = dominant wavelength

k = constant ($2898 \mu\text{m K}$)

T = absolute temperature (degrees Kelvin)

Energy of a photon

$$Q = h\nu$$

Q = energy of a quantum; joules (J)

h = Planck's constant, $6.626 \times 10^{-34} \text{ J s}$

ν = frequency





KAPASA MAKASA UNIVERSITY

DEPARTMENT OF AGRICULTURAL AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

27TH OCTOBER, 2025

09:00-12:00

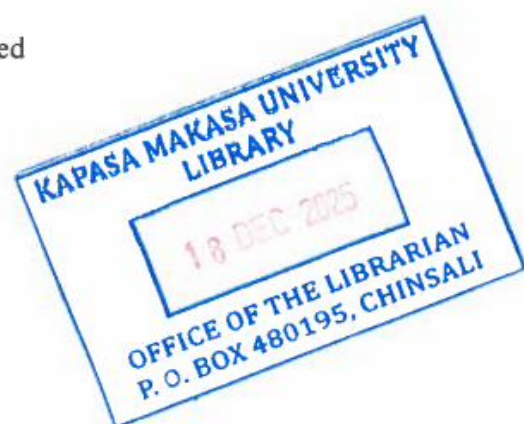
COURSE: CROP SCIENCE AND HORTICULTURE

SA 300

TIME ALLOWED: 3 HOURS

INSTRUCTIONS

- i. This question paper comprises of seven (7) questions
- ii. You are required to ATTEMPT a total of five (5) questions
- iii. Each question carries **20 marks**
- iv. Question I in SECTION A is **COMPULSORY**
- v. Choose 4 questions from SECTION B
- vi. Using any foreign material in an exam is prohibited



SECTION A

QUESTION 1 (compulsory)

- (a) Estimate the number of tomato plants expected in the field of one lima (50m X 50m) with the spacing of 0.3m between plants and 0.9m between roles. **12 Marks**
- (b) Calculate the quantity of fertilizer to apply per plant if the farmer has a total of 8 X 25kg bags. **8 marks**

SECTION B

QUESTION 2

- (a) Discuss the importance of shoot system of plants. **10 Marks**
- (b) What are some of shoot modification? **5 Marks**
- (c) What are some of root modification? **5 Marks**

QUESTION 3

- (a) Mrs Kalinda a resident of chinsali would like to set up a project to grow cut flowers and she has been advised to put up the nursery without any soil cultivation. As a student studying crop science and horticulture, why should you discourage her? **8 Marks**
- (b) What factors can she consider to select the site for the nursery? **6 Marks**
- (c) Mention nursery management practices that you can recommend. **6 Marks**

QUESTION 4

- (a) In details, discuss various methods that should be used to propagate plants in horticulture? **15 Marks**
- (b) Mention why vegetative propagation is not ideal for guavas and pawpaw? **5 Marks**

QUESTION 5

You have been employed as a manager at the farm growing vegetables. What measures can you take to control the following?

- (a) Pests and diseases. **8 Marks**
- (b) Moisture. **6 Marks**
- (c) Nutrition. **6 Marks**



QUESTION 6

- a) Explain the importance of vegetables. **10 Marks**
- b) With examples, classify various types of vegetables. **10 Marks**

QUESTION 7

- (a) Why is integrated pest management (IPM) important in modern horticulture?
10 Marks
- (b) Explain management practices that can be applied at the farm where both crop and aquaculture farming is done. **5 Marks**
- (c) Which is the final resort of the management practices? **5 Marks**





KAPASA MAKASA UNIVERSITY

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

NATURAL RESOURCE ASSESSMENTS

SA 310

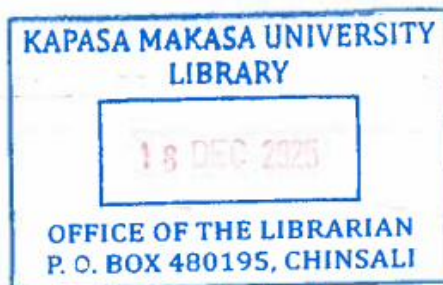
10TH NOVEMBER, 2025

09:00-12:00

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory Question in **Section A**
3. Answer any Two (2) questions out of 3 in **Section B (Aquaculture)**
4. Answer any Two (2) questions out of 3 in **Section C (Apiculture)**
5. Use TWO different answer booklets, 1 for economics and another for Entrepreneurship section
6. There are 100 marks allocated to this paper
7. Each question carries **20 marks**
8. Where possible, illustrate your answers
9. Time allowed: **Three 3 hours**
1. Cell Phones are NOT allowed in the Examination Room.

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO



SECTION A: Compulsory

Question 1

- a) Suppose that you want to carry out an inventory from a 100 acres forest land, using the sample plots of a tenth acre each. Calculate the number of plots needed for your inventory at 2% desired cover of plots. (4)
- b) Assuming that half of the needed number of plots you found in question (a) consist of five (5) trees and the other half consist of ten (10) trees each. Calculate the landscape tree density of that given forest land. (12)
- c) Briefly explain how you can establish a system of plots for carrying out an inventory in a given forest land. (4)

SECTION B: Choose any FOUR Questions

Question 2

- a) Briefly explain the importance of natural resource assessment in the context of sustainable agriculture. Use examples to support your explanation. (10)
- b) Explain the application of descriptive and inferential statistics in the measurement of natural resources. (6)
- c) Discuss how the knowledge in the following fields help in the assessment of natural resources.
 - i. Geometry (2)
 - ii. Ecology (2)

Question 3

- a) Mr Ndimu randomly selected 100 lemon seedlings from his nursery to find out which ones are health. Out of the sample 55 of them were found to be healthy.

Required

Estimate the proportion of lemon seedlings which are unhealthy with the following level of confidence.

- i. 99% level of confidence (3)
 - ii. 95% level of confidence (3)
- b) 9 trees are located in a sample plot of 50m x 100m. The DBH are 25cm, 30cm, 30cm, 25cm, 35cm, 35cm, 25cm, 30cm and 35cm respectively. Calculate the Basal Area of the plot. (6)
- c) Explain the difference between stand density and stand basal area. (2)
- d) Explain how the following are used in plot establishment
 - i. Fiberglass measuring tape (3)
 - ii. Compass (3)
 - iii. Cruise vest (3)



Question 4

Species in Area A and B

Species	Area A	Area B
Dog	185	25
Cat	180	10
Rabbit	165	900
Goat	170	25
Sheep	150	30
Cow	150	10

- a) From the table above:
- Calculate the Diversity of each area (2)
 - Calculate the relative abundance of each species in each area (4)
 - Identify the area with good evenness and explain why. (2)
- b) Explain how to determine a tree's form factor (6)
- c) Give an example of a taper equation and its appropriate use. (6)

Question 5

- a) A 500m x 200m even-aged forest has a population of ten thousand (10,000) trees. Each of these trees has the basal area of 0.25m^2 and the height of 10m. The rotation period of the trees in this forest is 15 years.

Required

- Calculate the area that can be harvested per year (8)
 - Calculate the volume that can be harvested per year (8)
- b) With the aid of a diagram explain Hundeshagen's method of yield regulation (4marks)

Question 6

- Explain the application of quadrats in natural resources assessment (6)
- Describe four (4) types of quadrats used in natural resources assessment (4)
- Explain the procedure of using the line transects in measuring natural resources (6)
- Describe any two types of line transects (4)



Question 7

Growth and yield models are used to find an optimum solution in the management of natural resources.

- a) Give a precise definition of a model. (2)
- b) Identify one growth model and explain how it is simulated. (10)
- c) Explain 4 reasons of holding stock in the context of natural resource management. (8)

THE END OF EXAM





KAPASA MAKASA UNIVERSITY

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATIONS

SUSTAINABLE AGRICULTURAL SYSTEMS

SA320

5th November, 2025

09:00-12:00

There are seven questions in total

Answer a compulsory question in **SECTION A**

Answer any four (4) questions out of the six in **SECTION B**

There are 100 marks allocated to this paper

Where possible illustrate your answers

When answering follow further instructions in the answer book

Time allowed is 3 hours





SECTION A: Compulsory Question

Question No.1

Mr. Grey Mbuzi is a student of Sustainable Agriculture class at Kapasa Makasa University and he has been assigned by the Sustainable Agricultural Society to offer a lecture to key agricultural stakeholders in chinsali district. The topic at hand is *“How can Conservation Agriculture strategies be specifically tailored to address the unique impacts of climate change in different agro-ecological zones in Zambia and what are the most effective adaptive measures”*. Discuss in detail the points Mr. Grey Mbuzi should advance to his audience? (20 marks)

SECTION B: Answer any 4 Questions in this section. Each question carries 20 marks

Question No. 2

As a student of Sustainable Agriculture, advance your justification to the donor community as to why the Zambian Government resorted to the administrative decisions below;

- (i) Creation of various categories for farmers (10 marks)
- (ii) Creation of the Agro-ecological Zones in the Country. (10 marks)

Question No.3

- (i) What are the potential negative consequences of excessive or improper ploughing on soil health? (10 marks).
- (ii) How has climate change, including changes in rainfall patterns, impacted the effectiveness of both chitemene and fundikila systems? (10 marks)

Question No.4

- (a) Discuss the principles of Conservation Agriculture. (10 marks)
- (b) Discuss the merits and demerits of conventional land preparation methods in all categories of farmers in Zambia. (10 marks)

Question No.5

- (i) What is bokashi? (3 marks)
- (ii) Describe the steps involved in the bokashi process. (7 marks)
- (iii) What are the primary benefits and drawbacks of Bokashi composting for smallholder farmers in Zambia, and how can its adoption be encouraged? (10 marks)



QUESTION No.6

- (i) What are the social and economic benefits of sustainable organic farming (8 marks)
- (ii) How can carbon farming practices contribute to mitigating climate change and what are the limitations to this approach in the Zambian Context? (12 marks)

QUESTION No.7

What are the long-term impacts of different minimum tillage strategies on soil organic matter, soil structure and water infiltration rates in Zambia's semi-arid and sub-humid regions?

(20 marks)

-END OF EXAMINATION-



KAPASA MAKASA UNIVERSITY

SCHOOL OF APPLIED SCIENCES

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

30TH OCTOBER, 2025

09:00-12:00

ANIMAL HUSBANDRY

SA 330

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory (CQ) in **Section A**
3. Answer any four (4) questions out of six in **Section B**
4. There are 100 marks allocated to this paper
5. Each question carries **20 marks**
6. Where possible, illustrate your answers
7. Time allowed: **Three 3 hours**
8. When answering follow further instructions in the answer book



SECTION A- Compulsory

Question One

A). Using a Pearson square, formulate a pig creep feed ration to have 18% crude protein using Maize meal number 3, Soya bean meal, limestone, Di-calcium phosphate (DCP) and a vitamin/mineral premix. You are reminded that the Limestone, DCP and the premix are fixed at 3.0, 2.0 and 0.3% inclusion level in the ration and the nutrient composition for the different feed ingredients used are as tabulated in Table 1. What are the energy, calcium and phosphorus contents in the formulated ration **(8 Marks)**?

Table 1: Nutrient composition of feed ingredients used in the formulation of a layers pullet developer.

Ingredient	Crude Protein %	Energy Kcal/kg	Calcium (%)	Phosphorous (g/kg)
Maize	9.0	3400	0.04	0.3
Soya Cake	43.0	2950	0.40	0.65
DCP	0	0	24	18
Limestone	0	0	38	0
Premix	0	0	0	0

B). Using algebraic expressions, formulate a broiler starter ration to have 23% Crude Protein (CP) using maize meal, barley meal, soy bean meal and fish meal. The ration is also designed to have 2.0% Limestone, 1.50% Di-calcium phosphate (DCP), 1.0% salt and 0.3% vitamin and mineral premix while the barley and fish meal are fixed at 23 and 4% of the ration. If the composition of the feed ingredients required for ration formulation are as given in Table 2, what are the energy, calcium and phosphorus contents of the diet **(12 Marks)**?

Table 2: Nutrient composition of feedstuffs required for the formulation of the pig grower diet.

Ingredient	Protein (%)	Digestible Energy*	Calcium (%)	Phosphorus (%)
Maize meal	9.0	3600	0.04	0.30
Barley	12.0	3700	0.03	0.30
Soy beans meal	44	2900	0.30	0.65
Fish meal	64	2800	1.8	3.2
Limestone	0	0	38	0
Di-calcium Phosphate	0.00	0.00	24.00	18.00
Pig grower Premix	0.00	0.00	0.00	0.00

Mcal/kg



SECTION B- Choose any 4 questions

Question Two

What are the advantages and disadvantages of keeping ruminants compared to that of non-ruminants in Zambia (8 Marks)?

What are the key limitations to increased ruminant production in the country and how can such limitations be addressed to promote and improve ruminant productivity (12 Marks)?

Question Three

A). What are some of the advantages of taking up the rearing on non-ruminants like pigs and poultry over the rearing on cattle or small ruminants as a commercial business venture in Zambia? 10 marks

B). What are the main limitations of using natural pastures as the main feed resource for grazing animals and how can you overcome such constraints for animals under your care? 10 marks

Question Four

Explain the importance of producing improved pastures as a way for improving animal productivity on commercial farms and what are the major constraints that hinder most of the Zambian farmers from engaging in pasture and fodder production (12 Marks)?

What do you understand by the term “meeting animal nutritional requirements” and how does this term fit in the developed animal feeding standards in Zambia (8 Marks)?

Question Five

A). By giving at least two (2) examples of each, explain the main differences between nutritional deficiencies and metabolic disorders and how can you minimize the occurrence of each disease type (8 Marks)?

B). Explain the difference between infectious and none infectious diseases that occur on farms and how can you implement a biosecurity system to prevent occurrence and spread of animal diseases on the farm (12 Marks)?



Question Six

- A). What is meat and explain why it is important to stun or immobilize animals before slaughtering them for food **(8 Marks)**?
- B). Explain why it is important to treat animals humanely during growth, during and after slaughter **(8 Marks)**?
- C). Why is bleeding of animals necessary before they are slaughtered and processed into different meat products **(4 Marks)**?

Question Seven

- A). Explain the key differences between mixed and integrated agriculture and what are the advantages of the two farming systems when compared with that of monoculture **(8 Marks)**?
- B). Give an example of an intergrated system that may involve production of crops, non-ruminants and aquaculture **(12 Marks)**?





KAPASA MAKASA UNIVERSITY

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATIONS

22nd OCTOBER, 2025

14:00-17:00

SOIL AND WATER MANAGEMENT

SA340

KAPASA MAKASA UNIVERSITY
LIBRARY

18-DEC-2025

OFFICE OF THE LIBRARIAN
P. O. BOX 480195, CHINSALI

INSTRUCTION: 1. There are seven questions in total

2. Answer a compulsory question in **SECTION A**
3. Answer any four (4) questions out of the six in **SECTION B**
4. There are 100 marks allocated to this paper
5. Where possible illustrate your answers
7. When answering follow further instructions in the answer book

SECTION A: Compulsory Question-40 Marks

Question No.1 (a)

- (i) Explain the genesis and characteristic of rocks as parent material. (5 marks)
- (ii) Briefly state the benefits derived from the knowledge of soil genesis. (5 marks)
- (b). In the hydrometer method for determining soil texture, 50 g oven dry soil was weighed and 50 cm³ of sodium metaphosphate was added. The suspension was stirred and transferred into the sedimentation cylinder and made to 1 liter mark using distilled water. The temperature of the suspension was 20°C.
 - (i) What are the underlying principles of the hydrometer method? (8 marks)
 - (ii) What is the use of sodium metaphosphate in determining soil texture? (2 marks)
 - (iii) Given that the hydrometer readings were 15 g/l and 7 g/l after 40 seconds and 8 hours of settling time respectively. Calculate % sand, % clay and % silt assuming the hydrometer reading for the suspension solution (blank) of 1 g/l both at 40 s and 8 hours. (15 marks)
 - (iv) Using the textural triangle provided in *Figure 1* on the appendix, determine the textural class name for this soil. (5 marks)

Question No.1

SECTION B: Answer any 4 Questions in this section. Each question carries 15 marks

Question No. 2

- (i) Define ppm and its significance in Soil Science? (5 marks)
- (ii) Mr. Brown Muliokela did a Soil analysis on his 1 ha farm in the interior of the Mkushi Farm block and the following results were obtained: Potassium (K⁺): 381 ppm, Magnesium (Mg²⁺): 124 ppm, Calcium (Ca²⁺): 1589 ppm, Sodium (Na⁺): 26 ppm. Calculate the following; Calculate the CEC in meq/100g soil (5 marks)
- (iii) Calculate the amount of exchangeable Ca²⁺ Mr. Brown will retain in Kg/Ha. Use the calculated CEC value of the soil in (i) and assume a plough layer of 20cm and a bulky density of 1.35g/cm³. (5 marks)

Question No.3

Define the following;

- (i) A-Horizon (2.5 marks)
- (ii) B-Horizon (2.5 marks)
- (iii) Compare and contrast the architecture and description of the Soil horizons in ecological region III and region I of Zambia, support your answer with an illustration. (10 marks)

Question No.4

Describe the roles of the *Dokuchaev's* soil forming factors in the formation of soils and their interrelationships. (15 marks)

Question No.5

- (i) State Darcy's Law and its limitations? (6 marks)
- (ii) A field sample of an unconfined aquifer is packed in a cylinder (with length 0.15m and diameter 0.11m), the field sample is tested for 8 minutes with an initial head of 15 cm and a final head of 10cm. Then 0.025litres is collected at the outlet. Determine the hydraulic conductivity of the aquifer sample in cm/s? (9 marks)

QUESTION No.6

- (i) Contrast the Saturated and Unsaturated water flow in Soils. (2 marks)
- (ii) State and list the major components of the Drip Irrigation System. (5marks)
- (iii) Explain how sub-surface drip irrigation differs from surface irrigation in terms of wetting patterns, water application and overall efficiency. (8 marks)

QUESTION No.7

Define the following terms, (from i to ii)

- (i) Gravimetric Moisture Content (θ_g) (2 marks)
- (ii) Volumetric Moisture Content (θ_v) (2 marks)
- (iii) Calculate the porosity of a soil sample that has a bulk density of 1.35 g/cm^3 . Assume the particle density is 2.65 g/cm^3 . (4marks).
- (iv) Calculate the bulk density of a soil sample when 25% of the pores are unsaturated. (7marks)



APPENDIX 1

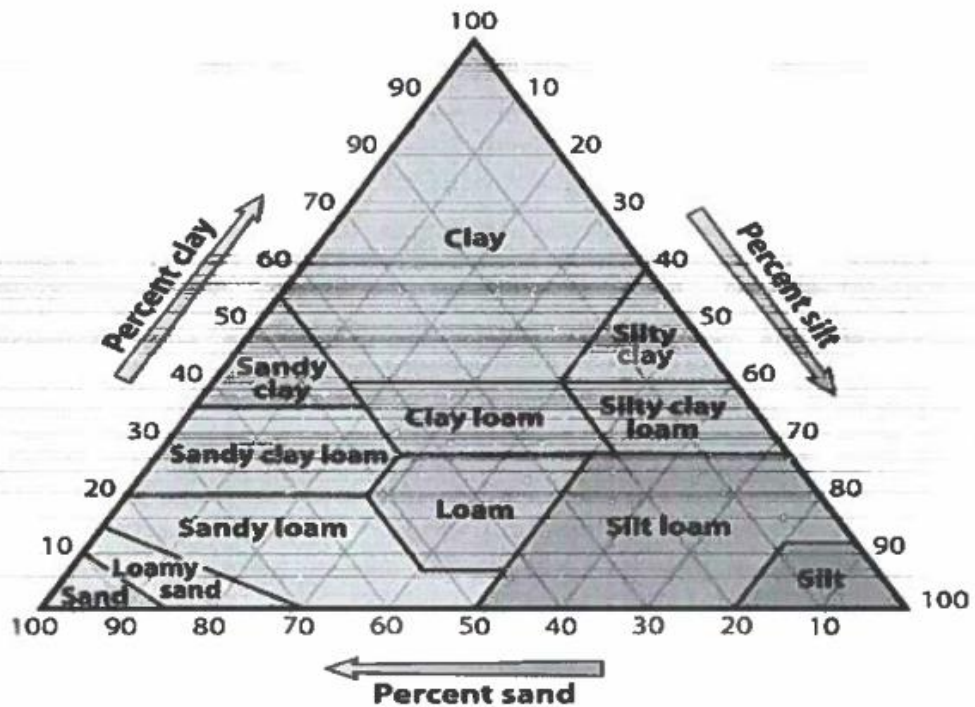


Figure 1: TEXTURAL TRIANGLE

-END OF EXAMINATION-





KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCES
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

23RD OCTOBER, 2025

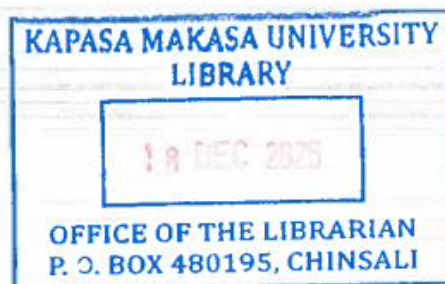
09:00-12:00

PLANT PROTECTION

SA 350

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory Question in **Section A**
3. Answer any four (4) questions out of six in **Section B**
4. There are 100 marks allocated to this paper
5. Each question carries **20 marks**
6. Where possible, illustrate your answers
7. Time allowed: **Three 3 hours**
8. When answering follow further instructions
9. Using unauthorized material is not allowed



DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

SECTION A- Compulsory

QUESTION 1

A commercial tomato grower Mr. Ezekiel Chotaya Sakala reports a sudden and significant rise in *Tuta absoluta* (tomato leaf miner) infestation in field. He has routinely and properly applied a broad-spectrum pyrethroid insecticide every 10 days for the past two months. Despite this, the damage remains severe, with noticeable leaf mines and tunneling in the fruits.

- a. What is the most probable cause for the failure of the routine insecticide application to control this particular pest? Justify your answer using relevant pest management concepts you learnt. **(7 marks)**
- b. Design a short-term, non-chemical intervention plan and a long-term, sustainable Integrated Pest Management (IPM) strategy for Mr Sakala. Include specific examples of cultural, and chemical controls (if necessary) and the monitoring techniques you would recommend. **(13 Marks)**

SECTION B- Choose any FOUR Questions

QUESTION 2

Mr Kiln Zulu, a wheat farmer notices patches of yellowing and stunted plants across a field in late spring. Upon close inspection, the lower leaves show lesions with purple-brown borders, and the infected stems appear slightly darkened at the base. Laboratory analysis confirms the presence of Fusarium Head Blight (FHB) inoculum and high levels of the pathogen *Fusarium graminearum* in the soil and residues. The local forecast predicts warm, humid weather during the critical flowering stage.

- a. Analyze this situation in the context of the Disease Triangle. Identify the components present and explain which component the farmer has the most immediate control over for the current season. **(10 marks)**
- b. Outline three (3) **non-chemical, cultural practices** the farmer should implement in the next cropping season to reduce the primary inoculum and disease severity. **(10 Marks)**



QUESTION 3

- a. Compare and contrast the life cycles of an insect that undergoes complete metamorphosis (holometabolous) versus incomplete metamorphosis (hemimetabolous). For each type, name a major crop pest and identify the stage that causes the most significant damage to a named crop.

(12 Marks)

- b. Discuss the four-tiered approach that anchors Integrated Pest and Disease Management (IPDM).

(8 marks)

QUESTION 4

- a. What do you understand by the following terms:

- i. Economic Threshold Level (2 Marks)
- ii. Alleleopathy (2 Marks)
- iii. Stridulation (2 Marks)
- iv. Phylogenetics (2 Marks)
- v. Oliphagus (2 Marks)

- b. Describe the difference between a contact fungicide and a systemic fungicide. Discuss the key benefits and drawbacks of using each type in a disease management program.

(10 Marks)

QUESTION 5

Insects have the ability to utilize the host plants by way of hiding themselves from the enemy, the term referred to as camouflage. Discuss in details at least 5 behavioral activities insect generate before establishing themselves on the host.

(20 Marks)



QUESTION 6

- a. Describe the differences between a contact insecticide and a systemic insecticide. Further, discuss the key benefits and drawbacks of using each type of the insecticide in a pest management program
(10 marks)
- b. Differentiate between a **monocyclic** and a **polycyclic** disease cycle. For each, name a representative disease and explain how the differences affect the rate of epidemic development and the choice of management strategy.
(10 Marks)

QUESTION 7

In details, clearly and explicitly explain the two major processes involved in post-embryonic growth of insects.

(20 Marks)

THE END OF THE EXAMINATION





KAPASA MAKASA UNIVERSITY

SCHOOL OF APPLIED SCIENCES

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

3RD NOVEMBER, 2025

14:00-17:00

CLIMATE CHANGE MITIGATION AND ADAPTATION

SA 400

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory (CQ) in **Section A**
3. Answer any four (4) questions out of six in **Section B**
4. There are 100 marks allocated to this paper
5. Each question carries **20 marks**
6. Where possible, illustrate your answers
7. Time allowed: **Three 3 hours**
8. When answering follow further instructions in the answer book
9. Using any unauthorised document in the exam room is prohibited

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LIBRARY

18 DEC 2025

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P. O. BOX 480195, CHINSALI

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SECTION A – Compulsory

QUESTION ONE

As a student of Climate Change Mitigation and Adaptation, you have been told to present at a youth climate action conference organised by Sustainable Agriculture 4th year students, titled “Awareness to Action.” Write your presentation highlighting the following:

- i. Using examples from Zambia what are the main causes of climate change [4 marks]**
- ii. Discuss the impacts on the agriculture sector, the climate smart agriculture strategies that Zambia is implementing in the sector and what are the outcomes of these strategies [10 marks]**
- iii. Conclude by discussing your policy recommendations to the Zambian Agriculture sector. [6 marks]**

SECTION B- Choose any 4 Questions

QUESTION TWO

Answer the following questions:

- A. What is Carbon tax? [5marks]**
- B. What is Carbon trading? [5 marks]**
- C. What is Resilience? [5 marks]**
- D. What is Climate Change? [5 marks]**

QUESTION THREE

Using practical examples, answer the following questions:

- A. What is Climate Change Adaptation [5 marks]**
- B. Anticipatory Adaptation [3 marks]**
- C. Private Adaptation [3 marks]**
- D. Reactive Adaptation [3 marks]**
- E. Public Adaptation [3 marks]**
- F. Planned Adaptation [3 marks]**

QUESTION FOUR

The Sustainable Development Goal Number 13 focuses on Climate Action, as a student of Climate Change Mitigation and Adaptation, using practical examples from Zambia, discuss the following:

- A. What is Climate Action? [2 marks]**
- B. In ways can you at individual level participate in Climate Action [4 marks]**
- C. Discuss barriers youth experience when participating in Climate Action [7 marks]**
- D. Discuss how you as a youth can overcome these barriers that hinder you from participating in climate action [7 marks]**

QUESTION FIVE

Zambia continues to experience severe impacts of climate change on its economic and social sectors. Using practical examples discuss the following:

- A. What are the impacts of climate change on Zambia's economic sector, what climate change adaptation and mitigation strategies are being implemented in Zambia to combat the impacts of climate change on the economic sector, what have been the outcomes of these strategies. [10 marks]**
- B. What are the impacts of climate change on Zambia's social sector, what climate change adaptation and mitigation strategies are being implemented in Zambia to combat the impacts of climate change on the social sector, what have been the outcomes of these strategies. [10 marks]**

QUESTION SIX

Answer the following questions:

- A. What is Climate Change Mitigation [5 marks]**
- B. Zambia is implementing several climate change mitigation strategies in the energy, mining and transport sector, using practical examples discuss these strategies in each of the three sectors and their outcomes? [15 marks]**

QUESTION SEVEN



Using practical examples discuss the following:

- A.** What are the impacts of climate change on Zambia's environmental sector, what climate change adaptation and mitigation strategies are being implemented in Zambia to combat the impacts of climate change on the environmental sector, what have been the outcomes of these strategies. **[10 marks]**
- B.** What are the impacts of climate change on Zambia's infrastructure sector (Roads, Buildings and bridges), what climate change adaptation and mitigation strategies are being implemented in Zambia to combat the impacts of climate change on the infrastructure sector, what have been the outcomes of these strategies. **[10 marks]**

END OF EXAMINATION



KAPASA MAKASA UNIVERSITY

SCHOOL OF APPLIED SCIENCES

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

28TH OCTOBER, 2025

14:00-17:00

RURAL SOCIOLOGY AND EXTENSION

AA 410

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory Question in **Section A**
3. Answer any four (4) questions out of six in **Section B**
4. There are 100 marks allocated to this paper
5. Each question carries **20 marks**
6. Time allowed: **Three 3 hours**
7. When answering follow further instructions in the answer book
8. Using any unauthorized document in the exam room is prohibited



DO NOT TURN THIS PAGE UNTIL YOU HAVE BEEN TOLD TO DO SO BY THE CHIEF INVIGILATOR

SECTION A- Compulsory

QUESTION ONE

As a student of Rural Sociology and Extension, you have been called upon to discuss the following questions to community radio listeners:

- A. Discuss three forms of Extension Services [3 marks]
- B. Using practical examples from Zambia, discuss the challenges Extension officers face in the delivery of extension services to farmers? [5 marks]
- C. What solutions has the government put in place to overcome the challenges Extension officers face in the delivery of extension services to farmers and what are the outcomes? [5 marks]
- D. What recommendations would you provide to the Ministry of Agriculture to ensure effective delivery of extension services to farmers? [7 marks]

SECTION B- Choose any Four questions

QUESTION TWO

Discuss the differences between rural and urban areas in Zambia in terms of:

- A. The Education sector, [5 marks]
- B. The Health sector, [5 marks]
- C. The Economic sector, [5 marks]
- D. Physical infrastructure [5 marks]



QUESTION THREE

Answer the following questions:

- A. What is Socialization? [3 marks]
- B. Using practical examples, discuss the four main agents of Socialization? [17 marks]

QUESTION FOUR

Discuss the following questions:

- A. Four characteristics of peasant farmers [7 marks]
- B. Rural Sociology [3 marks]
- C. Rural development [10 marks]

QUESTION FIVE

Answer the following questions:

- A. Define Social Change [2 marks]
- B. Discuss the four types of Social Change [4 marks]
- C. What are the main facilitators of Social Change in rural societies [5 marks]
- D. Discuss the four barriers to Social Change in rural societies [4 marks]
- E. In your opinion, what can help the Zambian government reduce the barriers to Social Change in rural societies [5 marks]

QUESTION SIX

Answer the following questions:

- A. Discuss Sustainable Development [2 marks]
- B. Using practical examples, discuss the following types of Sustainability:
 - i. Social Sustainability [6 marks]
 - ii. Environmental Sustainability [6 marks]
 - iii. Economic Sustainability [6 marks]

QUESTION SEVEN

As an Extension officer, you have noticed that farmers are expanding into forest for their agricultural activities, explain to them the benefits that farmers derive from the forest, what are the effects of community members expanding into forest for their agricultural activities and what solutions can you provide to the farmers to stop expanding into the forest? [20 marks]

END OF EXAMINATION





KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCES AND OPEN LEARNING
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES
BACHELOR OF SCIENCE DEGREE IN SUSTAINABLE AGRICULTURE
SA411 – LAND USE MANAGEMENT

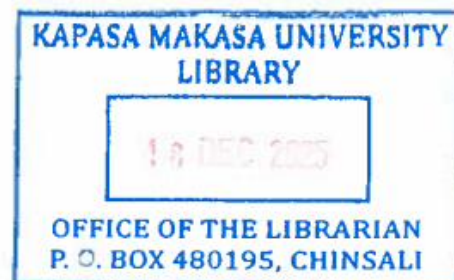
EARLY-SESSIONAL EXAMINATION

DATE: 29 JULY 2025

TIME: THREE (3) HOURS

INSTRUCTIONS

- (a) Write your Student Identification Number on the Answer Booklet provided
- (b) There are seven questions in this paper. **Write any five questions (5)**
- (c) Be logical in your answers.
- (d) Be neat and legible.



DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO.



KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCE AND OPEN LEARNING
SCHOOL OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

6TH NOVEMBER, 2025

14:00-17:00

COURSE: NATURAL RESOURCE ECONOMICS

SA 420

DR. MULWANDA C. & MR NKWETO E.

DURATION: 3 HOURS.

TOTAL MARKS: 100

General Instructions to Candidates:

1. There are **TWO** sections in this paper (A, and B).
2. Each question carries 20 marks
3. No unauthorized materials are allowed
4. Use of approved calculator is allowed.
5. Start each answer on a new page.
6. Ensure that your identification number is clearly indicated.
7. Write clearly and legibly.



SECTION A: Question 1 is compulsory



QUESTION 1

a) Define the concept of market equilibrium, and using a well-labeled demand and supply diagram, show how equilibrium price and quantity are determined. [5]

b) With examples, explain the role of scarcity and choice in economics and discuss how the concept of opportunity cost helps both households and firms in making production decisions. [5]

c) List and explain any three factors that determine price elasticity of demand. [5]

d) Criteria for Accepting or Rejecting Investment Alternatives:

i) Project A requires K180,000 and returns K60,000 annually for 4 years. Project B requires K250,000 and returns K70,000 annually for 5 years. If the discount rate is 10%, which project is more viable based on NPV? [2]

ii) The road construction between Chinsali and Mpika requires k200,000 and returns k30,000 annually for 5 years. If the discount rate is 10%, is the project viable based on NPV? [2]

iii) Kapasa Makasa University is planning a graduation square with present value cost of K45,000 000 and present value of benefits of k50,000 000. Should the project proceed based on BCR? [1]

SECTION B: Answer any FOUR questions from this section

QUESTION 2

- a) Define opportunity cost and explain its importance in decision-making. [5]
- b) With the aid of a Production Possibility Curve (PPC), illustrate the concept of opportunity cost. [5]
- c) Explain the factors that may cause an outward shift of the PPC. [5]
- d) What does a point inside the PPC represent? Explain with an example. [5]

QUESTION 3

- a) Define Agricultural Economics and explain its importance in Zambia's economy. [10]
- b) Explain the relationship between agriculture and economics, focusing on farm-level decision-making and production costs. [10]



QUESTION 4

In 2016 and 2024, Zambia experienced severe droughts that led to high maize prices. Despite the price hikes, demand for maize remained steady.

- a) Using economic theory, explain why the demand for maize in Zambia is relatively price inelastic. [10]
- b) Contrast this with the price elasticity of demand for export crops such as tobacco and cotton, explaining the underlying reasons. [10]

QUESTION 5

Price volatility of Non-Timber Forest Products (NTFPs) is a major challenge in Zambia.

- a) Explain three factors that contribute to price volatility of NTFPs. [10]
- b) Suggest economic and policy measures that can help reduce risks associated with price volatility. [10]

QUESTION 6

A commercial farm in Central Province is expanding maize production using heavy fertilizer application and intensive irrigation. While yields have increased, the surrounding community reports declining fish stocks in nearby rivers and reduced groundwater levels.

- a) From an environmental economics perspective, identify and analyze the negative externalities involved. [10]
- b) Propose three sustainable agricultural practices the farm could adopt to maintain yields while reducing environmental harm. [10]

QUESTION 7

- a) Critically evaluate the economic role of land as a factor of agricultural production, highlighting its unique characteristics compared to other factors of production. [10]
- b) Examine the principal land-related challenges confronting agricultural productivity in Sub-Saharan Africa, with specific reference to Zambia. [10]





KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCES
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

13TH NOVEMBER, 2025

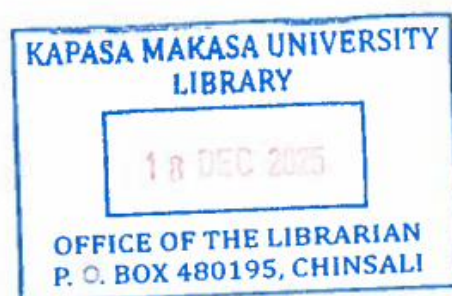
14:00-17:00

AGROCLIMATOLOGY

SA 430

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory Question in **Section A**
3. Answer any four (4) questions out of six in **Section B**
4. There are 100 marks allocated to this paper
5. Each question carries **20 marks**
6. Where possible, illustrate your answers
7. Time allowed: **Three 3 hours**
8. When answering follow further instructions in the answer book
9. Unauthorized materials are not allowed in the examination room





SECTION A- Compulsory

QUESTION 1

- a. Define Evapotranspiration and explain the components that comprises it (5 marks)
- b. Explain how the concept of Crop Water Requirement is used in developing efficient irrigation schedules, making a distinction between Reference evapotranspiration and actual Crop Evapotranspiration (12 Marks)
- c. What does transpiration ratio mean? (3 marks)

SECTION B- Choose any 4 questions

QUESTION 2

Discuss various factors that influence the type and amount of rainfall (20 marks)

QUESTION 3

- a. Explain the following terms as they relate to rainfall:
 - i) Intensity [2]
 - ii) Distribution [2]
 - iii) Frequency [2]
- b. Draw and discuss the hydrological cycle (14 Marks)

QUESTION 4

- a. With the help of the diagram, explain cyclonic precipitation (10 Marks)
- b. Each cloud family has its own distinct cloud species based on the altitude at which they form. In details, explain the cloud families and their distinct species. (10 Marks)

QUESTION 5

- a. List and briefly explain the four major elements of climate that influence agricultural productivity. **[12 marks]**
- b. Differentiate between weather and climate, list and explain at least 5 differences **[5 marks]**
- c. Differentiate between meteorological drought and hydrological drought **(3 marks)**

QUESTION 6

- a. With the help of the diagram, explain orographic precipitation **(10 marks)**
- b. Explain concisely how farmers can mitigate the effects of unpredictable rainfall patterns on crop production? **[10 marks]**

QUESTION 7

- a. In details, explain both direct and indirect impact of climate variables on agriculture **(12 marks)**
- b. Discuss various challenges that come with supplemental irrigation and how to overcome or minimize them **(8 Marks)**

