THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCE

END OF YEAR EXAMS 2017/2018

1. AGA 3201 PRINCIPLES OF ANIMAL NUTRITION
2. AGA 4532 PIG POUTRY PRODUCTION
3. AGC 5331 WEED SCIENCE
4. AGE 2122 FUNDAMENTALS OF MICROECONOMICS
5. AGE 3031 INTERMEDIATE MICROECONOMICS
6. AGE 5151 INTERNATIONAL AGRICUTURAL MARKETS TRADE AND DEV
7. AGE 5241 PRINCIPLES OF FARM MANAGEMENT
8. AGF 2251 FUNDAMENTALS OF ELECTRICAL ENGINEERING FOR FOOD SCIE
9. AGF 2401 INTRODUCTION TO INFORMATION TECHNOLOGY AND COMM
10. AGF 5432 FOOD SAFETY AND QUALITY MANAGEMENT
11. AGN 4321 RESEARCH METHODS AND EPIDEMIOLOGY FOR NUTRITIONISTS
12. AGS 5511 AGRICULTURAL HYDRAULICS AND IRRIGATION DESIGN
13. AGS 5411 SOIL MICROBIOLOGY
14. AGS 5121 SOIL GENESIS AND CLASSIFICATION
15. AGS 3711 AGROCLIMATOLOGY

UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF ANIMAL SCIENCE

AGA 3201- PRINCIPLES OF ANIMAL NUTRITION
DIFERRED EXAM
26 DECEMBER 2018

INSTRUCTIONS TO CANDIDATES

Answer any **FIVE** (05) questions. All questions carry 20 equal marks
Use separate a answer booklet for each section
TIME ALLOWED: THREE (3) HOURS

SECTION A

1.0 A). What are the main sources of energy that are used for feeding non-ruminants (4 Marks)?

B). What are the key functions of the tricarboxylic acid cycle (TCA) and how is the metabolism of fats, proteins and carbohydrates integrated through this cycle (10 Marks)?

C) Explain how the energy conserved in reduced coenzymes NADH + H and FADH2 is regenerated through the electron transport chain and oxidative phosphorylation (6 Marks)?

2.0 A). Explain the digestion of proteins in different segments of the gastro-intestinal tract of non-ruminants by highlighting the enzymes involved and the products generated (8 Marks)?

B). With the help of a diagram, explain the process by which excess nitrogen is released from animal tissues after the degradation of amino acids in mammals (6 Marks)?

C). Explain how the different amino acids generated from the diet are utilized by the host animal (6 Marks)?

3.0 A). With the help of a diagram, explain how storage fatty acids are mobilized to generate energy for the host animal through the process of beta (ß) oxidation (8 Marks)?

B). Explain why the Pentose Phosphate Pathway is sometimes referred to as the alternative pathway and what are the key products of the pentose pathway and how are they utilized by the host animal (12 Marks)?

SECTION B

1. A) What are the sources of carbohydrates for the ruminant animal (4 Marks)

   B) Discuss in detail carbohydrate digestion in the rumen and explain how are the products of digestion are utilized by the host animal. (16 Marks)

2. A) Discuss four (04) important factors that influence Metabolisable energy content of animal feeds. (8 Marks).

   B) Explain how environmental temperatures influence metabolic rates in endotherms (warm blooded animals) (4 Marks)

   C) Define basal metabolic rate (BMR) and discuss any three (03) factors that influence BMR (8 Marks)

3. Write short notes on the following (4 Marks each)

   A) Biochemistry of events that occur in ketosis

   B) Common properties of fat soluble vitamins

   C) Role and mode of action of the parathyroid hormone in an animal's body.

   D) Four (04) anti-nutritional factors found in soya beans and state the modes of action for each of them.

   D) Substantiate the statement. ''In ruminant animals, the type of feed influences the ruminal microbial population, the rate of digestion and the dry matter intake''

UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
ANIMAL SCIENCE DEPARTMENT

2017/2018 ACADEMIC YEAR DEFERRED EXAMINATIONS

COURSE AGA 4532: PIG AND POULTRY PRODUCTION

DATE OF EXAMINATION: 26TH DECEMBER, 2018

DURATION: THREE (3) HOURS

INSTRUCTIONS TO CANDIDATES:

i. **Answer all questions.**
ii. **Marks for each question are as shown.**
iii. **Write the answers for each Section in separate answer books and mark books appropriately as Section A or B.**

SECTION A POULTRY PRODUCTION

Q1. For a fertile egg to hatch into a good quality chick it has to be carefully selected and provided with the right conditions. Write in detail on the selection criteria and incubation conditions required for successful hatching of eggs into healthy chicks. **(20 Marks)**

Q2.

a. Imagine you are the Livestock Extension Officer for an Organization for Youth Empowerment. A group of youths come to you for guidance on how to manage 1000 broiler chicks which are due to arrive in a month's time. What advice will you give them? **(15 Marks)**

b. Explain why quails are reared in cages. **(5 Marks)**

Q3. There are two main systems for rearing commercial egg or meat producing chickens. These are (i) the 'deep-litter' system; and (ii) the 'battery' or 'cage' system of management. What are the advantages and disadvantages of each of these management systems? **(20 Marks)**

SECTION B PIG PRODUCTION

Q1. You are the Livestock Extension Officer for Rufunsa District. The District Agricultural Coordinator (DACO) asks you to prepare a presentation for a group of farmers who have been organized by an NGO to start organic pig production. The members of the farmer group do not know anything about organic pig production. You have been asked to give a brief presentation highlighting the main features of organic pig production using the following subheadings:

a. Four (04) general features of organic pig production **(2 Marks)**
b. Four (04) goals of organic pig production **(2 Marks)**
c. Criteria for breed selection and 3 reasons for the selection criteria, citing two (2) of the preferred pig breeds for Zambia **(3 Marks)**
d. General principles of housing pigs **(4 Marks)**
e. General principles of feeding pigs **(2 Marks)**
f. Five (05) disease prevention practices employed in pig husbandry **(2 Marks)**
g. List four (04) benefits of organic pig production **(2 Marks)**
h. Six major challenges likely to be faced by organic pig farmers **(3 Marks)**

You can proceed and prepare the presentation.

Q2. A farmer wants to start an intensive pig production enterprise which will be a 30 sow unit. He asks you to help him calculate the number of pens to be constructed, taking into consideration the following factors:

- Farrowing rate = 2 farrowings/sow/year
- Average number of piglets to be born/sow = 12
- Average number of piglets to be weaned = 90%
- Age at weaning = 5 weeks
- Sows enter the farrowing pen one week before farrowing and the pens are rested for a week after weaning.

- Dry sows and pregnant sows will be group housed until one week before farrowing
- Weaners will occupy the weaner pens for 12 weeks before being disposed of as porkers. The weaner pens will be rested for one week before the next batch.
- The farmer wants the pens to be 4m X 3m for weaner pens and the dry and pregnant sows to be group housed in 5m X 5m pens.
- Note that the recommended space requirements are $0.80m^2$ for weaners and $5m^2$ for dry and pregnant sows.

a. Calculate the expected number of farrowings /year. **(1 Mark)**
b. Calculate the number of farrowing pens needed. **(2 Marks)**
c. How many weaners can each weaner pen accommodate? **(2 Marks)**
d. Calculate the number of weaner pens that need to be constructed. **(2 Marks)**
e. Calculate the number of dry pregnant sows that each dry sow pen can accommodate. **(1 Mark)**
f. Calculate the number of dry sow pens needed. **(2 Marks)**

Q3. Give physiological reasons for the following:

a. Why piglets are prone to hypothermia. **(2 Marks)**
b. Why piglets are prone to iron deficiency anemia. **(2 Marks)**
c. Why *E coli* diarrhoea infection commonly occurs just after weaning in piglets. **(2 Marks)**
d. Why adult pigs are prone to stroke. **(2 Marks)**
e. Why lysine is considered a first limiting amino acid for pigs **(2 Marks)**

END OF EXAMINATION

UNIVERSITY OF ZAMBIA
School of Agricultural Sciences
Department of Plant Science

AGC 5331: Weed Science
2017/2018 Deferred Examination

Date: 26th December, 2018 **Time: 09-12 hrs** **Venue: Sports Hall**

INSTRUCTION: Answer QUESTION 1 and any THREE (3) questions

QUESTION 1 (40 Marks)

a) Describe **FIVE** individual characteristics of weeds (15 marks)

b) Complete the table below (16 marks)

Family	Common Name	Scientific Name
Amaranthaceae		
Convolvulaceae		
Euphorbiaceae		
Malvaceae		
Pontedenaceae		
Commelinaceae		
Poaceae		
Portulacaceae		

c) Define the following terms (9 marks)

i. Weed

ii. Noxious weed

iii. Solarization

iv. Functional allelopathy

v. Agrestal weed

vi. Ruderal weed

vii. Ephemeral weed

viii. Perennial weed

ix. Apoplastic absorption

QUESTION 2 (20 marks)

a) Define Cultural weed control and describe its components (15 marks)

b) Explain the classification of herbicides based on "type of application" (5 marks)

QUESTION 3 (20 marks)

a) What is Biological control of weeds? (1 mark)

b) Discuss the components of Biological weed control (19 marks)

QUESTION 4 (20 marks)

a) Explain the reasons for popularity of Chemical weed control (8 marks)

b) State SEVEN ways by which herbicides are classified (7 marks)

c) Describe the advantages of Integrated weed management (5 marks)

QUESTION 5 (20 marks)

a) Discuss the components of preventive weed control (16 marks)

b) Describe the indirect losses caused by weeds (4 marks)

END OF EXAMINATION

THE UNIVERSITY OF ZAMBIA
Department of Agricultural Economics and Extension

2018 Academic Deferred Examination

AGE 2122 Fundamentals of Macroeconomics

Duration: Three (3) hours

INSTRUCTIONS: The marks for each question are as indicated. Answer **ALL** the questions.

1) Given the system:

$$Y = C + I + G + X - M$$

$C = 100 + 0.8y_d$	Consumption function
$I = 150$	Investment function
$G = 200$	Government expenditure
$S = -100 + 0.2Yd$	Savings function
$T = 0.2Y$	Tax function
$X = 100$	Exports
$M = 0.05Yd$	Imports

Where Y is the level of national income.

a. Find the equilibrium level of national income **(5 marks)**
b. Is there a budget surplus or budget deficit at equilibrium level of income **(5 marks)**
c. Is the balance of trade in deficit or surplus at equilibrium level of income? **(5 marks)**
d. What is the value of the multiplier in this economy? **(5 marks)**

2) Answer the following question:
   a. What are the determinants of investment? **(5 marks)**
   b. Why do national income accountants include only final goods in measuring total output? **(5 marks)**
   c. Explain the difference between demand-pull and cost-push inflation **(5 marks)**
   d. Evaluate as accurately as you can the manner in which each of the following individuals have been affected by fairly rapid inflation:

i. A pensioned civil servant **(2 marks)**
ii. A heavily indebted farmer **(5 marks)**

3) Explain briefly what you understand by the following concepts or terms:
   a. Frictional unemployment. **(5 marks)**
   b. Expansionary fiscal policy. **(5 marks)**
   c. Fiscal drag. **(5 marks)**
   d. Inflationary gap. **(5 marks)**
   e.

4) The demand for money in a country is given by $M^d = 10{,}000 - 10{,}000r + P.Y$. If the national income is initially 5,000
   a) Illustrate graphically the quantity of money demanded in relation to the interest rate **(5 marks)**
   b) Suppose the money supply is set at 10,000, find the equilibrium rate of interest and show it graphically **(5 marks)**
   c) If the national income increases to 7,500 and money supply remain unchanged, what would happen in this economy? **(5 marks)**
   d) Suppose that the central bank wants to keep the equilibrium interest rate at the same value as in (b) above, what should it do? Show your calculations **(5 marks)**

5) The following table gives figures for yields per acre in Zambia and Malawi

	Wheat	*Soy beans*
Zambia	48	39
Malawi	40	24

   a) If we assume that farmers in Zambia and Malawi use the same amount of resources, which country has an absolute advantage in wheat production and which one in soybean production? **(4 marks)**
   b) If land is transferred out of wheat into soybean, how many kilograms of wheat would be given up in Zambia per additional kilogram of soybeans produced? **(5 marks)**
   c) Which country has a comparative advantage in the production of wheat and soybeans? **(5 marks)**
   d) Show the gains of trade from comparative advantage **(6 marks)**

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

DEFERRED EXAMINATIONS—2017/18 ACADEMIC YEAR

COURSE NAME: INTERMEDIATE MICROECONOMICS

COURSE CODE: AGE 3031

DATE: 26TH DECEMBER, 2018

TIME: 09:00 – 12:00

TOTAL MARKS: 100

INSTRUCTIONS:

1. Answer all five (5) questions in this examination paper.

2. Answer questions 1 to 3 in a separate answer booklet and questions 4 and 5 in another answer booklet. If at all you need more booklets to complete answering the questions, the booklets for questions 1 to 3 should be tied together and do the same for questions 4 and 5.

3. Write legibly and show your work as you attempt each question.

1. For each of the following four statements below, state whether the situation described is **TRUE** or **FALSE**. To get full credit, please provide a logical and well-argued explanation to justify your choice of answer.

   a) A monopolist has a constant marginal cost of 1. Suppose the inverse demand curve faced by the monopolist is $P = 5 - 0.05Q$, his profit-maximising price and quantity will be 3 and 40 respectively. **(5 marks)**

   b) A consumer's utility for goods X and Y is represented as $u = \min(10X, Y)$. If the prices of the two goods are $P_X = P_Y = 1$ and income is $I = 110$ her utility maximising bundle will be $X = 10$ and $Y = 1$. **(5 marks)**

   c) The concepts of marginal rate of substitution (MRS) and marginal rate of technical substitution (MRTS) are one and the same thing. **(5 marks)**

   d) The elasticity of substitution of a Leontief production function is zero. **(5 marks)**

2. J. Fire's preferences over consumption bundles of two goods (X, Y) are summarised by the following utility function:

$$u = 16X - 2X^2 + 4Y$$

   Let P_X and P_Y be the prices of goods X and Y respectively and I be J. Fire's income. Assuming he maximizes utility subject to his budget constraint:

   a) Derive his Marshallian demand functions for X and Y. **(8 marks)**

   b) Based on the derived Marshallian demands in part a), does an increase in income have any effect on the quantity demanded of each good? Explain and show your work. **(6 marks)**

   c) Based on the derived Marshallian demands in part a), does an increase in income and prices of both goods by the same proportional amount of 50% have any effect on the quantity demanded of each good? Explain and show your work. **(6 marks)**

3. An agribusiness firm plans to produce tractor rippers using the technology:

$$q = KL$$

   where K is capital measured in machine-hours, L is labour measured in person-hours and q denotes rippers produced per year. The hourly wage rate $w = 10$ and the hourly rental rate of capital is $r = 20$:

   a) Does the technology for producing tractor rippers display increasing, constant or decreasing returns to scale? Show your work. **(3 marks)**

   b) Compute the marginal physical products of L and K and interpret your results. **(5 marks)**

   c) Assuming the firm operates rationally (minimises costs), what will be the optimal levels of L and K that will be required to supply 20,000 rippers per year? **(12 marks)**

4. Assume a simple pure exchange economy with two agents; A and B and two goods; *X* and *Y*. Further, the utility functions for the two agents are as follows:

$$U^A = (20 - 0.125X_A)X_A + Y_A$$

$$U^B = (20 - 0.1X_B)X_B + Y_B$$

In addition, the initial endowments of good X and Y are as follows:

$$w_X^A = 80 \quad , w_Y^A = 50$$

$$w_X^B = 10, \quad w_Y^B = 500$$

a. Derive each consumer's demand function for both good *X* and *Y*. **(8 marks)**

b. Compute the general equilibrium price ratio in this economy. **(4 marks)**

c. How much of good *X* and *Y* do consumer A and B buy, sell, and consume in the equilibrium? **(4 marks)**

d. Use an appropriate diagram to depict the situation after trade. **(4 marks)**

5. Suppose that the production of good X imposes external costs on goods produced by third parties.

i. Define an externality. **(2 marks)**

ii. Illustrate how such an externality can best be solved. **(8 marks)**

iii. What is pareto improvement? **(2 marks)**

iv. What do you understand by market failures? **(3 marks)**

v. State the Walras' law as used in general equilibrium **(5 marks)**

------ END OF EXAM-----

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

DEFERRED EXAMINATIONS—2017/18 ACADEMIC YEAR

COURSE NAME:	INTERNATIONAL AGRICULTURAL MARKETS, TRADE AND DEVELOPMENT
COURSE CODE:	AGE 5151
DATE:	26TH DECEMBER, 2018
TIME:	14:00 – 17:00 HRS
MARKS:	100

INSTRUCTIONS:

1. This examination paper has two sections. Section A has twenty-five (25) multiple-choice questions and Section B has three (3) open ended questions. Answer all questions from both sections.
2. Clearly show your work in your answers to Section B questions.
3. Please be concise in answering the questions and write legibly.

SECTION A (25 points – 1 point each)

1. Which of the following is not a very good explanation for why nations trade?
   A. It enables consumers in the importing country to have a larger and more diverse bundle of goods and services available at lower overall prices
   B. The World Trade Organization (WTO) mandates that nations should trade
   C. The existence of comparative advantage produces an area of potential trade within which both countries can make better deals for themselves through international exchange than by adjusting its own resources internally
   D. There are economy-wide gains from trade both from an exchange of goods and from the ability to specialize in production

2. "Zambia should promote exports and substantially minimise imports in order to create trade surplus." Which school of thought would you attribute this statement?
   A. Humanism
   B. Mercantilism
   C. Capitalism
   D. Socialism

3. Which of the following is not true about the Ricardian model?
   A. It assumes perfect competition
   B. It assumes that there is only one factor of production, capital
   C. It is a partial equilibrium model
   D. Both B and C

Use the following table to answer questions 4 – 6. Suppose that labour can produce flowers or chocolate in country A and B. Below is the table that indicates the labour productivities in each country.

	Flowers	Chocolate
Country A	20 units/hour	120 units/hour
Country B	10 units/hour	30 units/hour

4. Which of the following is true?
   A. Country A has an absolute advantage in flowers
   B. Country B has a comparative advantage in flowers
   C. Country B has a comparative advantage in chocolate
   D. Both A and B

5. Both countries would benefit if
   A. Country A produced both commodities and did not trade with Country B
   B. Country B produced both commodities and did not trade with Country A
   C. Country A exported chocolate and imported flowers
   D. Country A exported flowers and imported chocolate

6. Which workers would experience an increase in real wages if the two countries specialized in their respective comparative advantage good and traded freely?
   A. Workers in Country A's chocolate industry
   B. Workers in Country A's flower industry
   C. Workers in Country B's chocolate industry
   D. None of the workers

7. What theory of trade is appropriate to explain trade between countries with similar resource endowments?
   A. Ricardian Model
   B. Absolute advantage theory
   C. H-O model
   D. Economies of scale in production

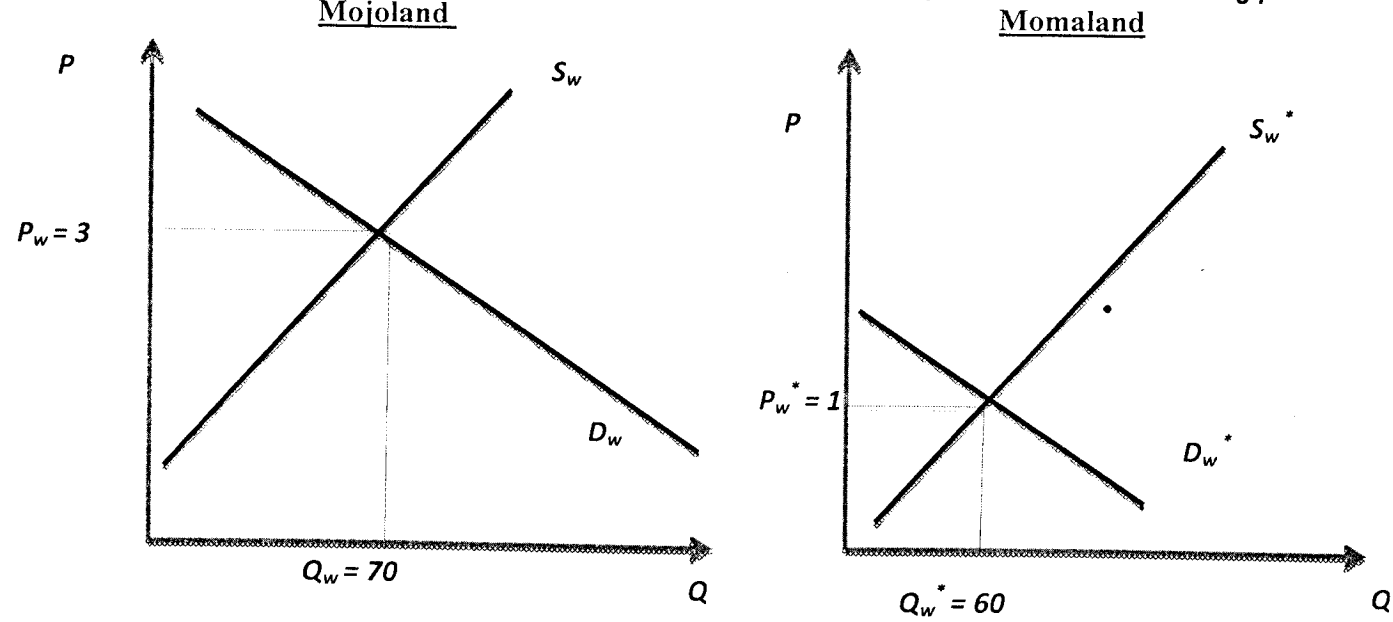
8. The theorem of the H-O model that states that if the price of the labour-intensive good rises then the price of labour will rise while the rental rate paid to capital will fall is called the:
   A. Heckscher-Ohlin theorem
   B. Stolper-Samuelson theorem
   C. Rybczynski theorem
   D. Factor-Price Equalisation theorem

9. If Zambia is labour abundant, based on the H-O model, the group that would gain from trade is:
   A. Capitalists
   B. Workers
   C. Both groups would gain
   D. No losers or gainers

10. The general version of the Rybczynski theorem is called the
   A. Magnification effect for quantities
   B. Magnification effect for prices
   C. Factor-price equalization theorem
   D. H-O model

11. When economists say trade is not a zero sum game, they mean that
   A. The sum of the gains to the winners is exactly equal to the sum of the losses to the losers
   B. The sum of the gains to the winners is less than the sum of the losses to the losers
   C. The sum of the gains to the winners is greater than the sum of the losses to the losers
   D. Countries are able to retaliate or engage in trade wars

Answer questions 12 – 13 by referring to the demand and supply of wheat for two trading partners



12. What is not true based on the information presented on these graphs?
    A. Mojoland will import wheat from Momaland in free trade
    B. Momaland will export wheat to Mojoland in free trade
    C. The free trade equilibrium price of wheat will be less than 1
    D. The free trade equilibrium price of wheat will lie between 1 and 3

13. What do the quantities 70 and 60 represent?
    A. Equilibrium quantities in free trade
    B. Equilibrium quantities in autarky
    C. 70 is the equilibrium quantity in free trade and 60 is the equilibrium in autarky
    D. 70 is the equilibrium quantity in free autarky and 60 is the equilibrium in free trade

Answer questions 14 – 16 by referring to the following trade policy game between two countries.

	(USA, Japan)	Japan	
		Free Trade	Optimal Tariffs
USA	Free Trade	(200, 200)	(140, 240)
	Optimal Tariffs	(240, 140)	(180, 180)

14. Assuming the two countries seek to optimise national welfare, would Japan retaliate if the USA decided to impose optimal tariffs?
    A. No, Japan would choose free trade
    B. No, Japan would choose not to play any of the available strategies
    C. Yes, Japan would choose optimal tariffs
    D. None of the above

15. Assuming the two countries seek to optimise national welfare, what would be Japan's best response strategy if the USA decided to go for free trade?
    A. Japan would choose free trade
    B. Japan would choose not to play any of the available strategies
    C. Japan would choose optimal tariffs
    D. Japan would be indifferent (they could choose free trade or optimal tariffs)

16. Does the outcome of this game as depicted by your answers to question 14 and 15 help justify a trade liberalization organization like the World Trade Organization?
    A. Yes
    B. No
    C. It depends on the size of the two countries in global markets
    D. It depends on the frequency of trade between the two countries

17. A government might want to devalue its currency if
    A. Exporters have a strong lobbying arm
    B. Import buyers have a strong lobbying arm
    C. Policymakers worry about high domestic inflation rates
    D. Foreign governments tell it not to

18. Dumping occurs when a firm
    A. Sells too much of a good in a foreign country
    B. Sells in a foreign country at prices that are below fair value
    C. Sells in its home market at prices that are below the average price charged by its competitors
    D. Sells in a foreign market at prices that are below the prices charged by firms based in that market

19. Which of the following statements is **FALSE**?
    A. Zambian imports of South African oranges will create a demand for the South African Rand
    B. If all Zambians decide to buy Indian Basmati rice, the Kwacha will appreciate relative to the Indian Rupee
    C. A change from K10.50/$ to K9.67/$ represents an appreciation of the Kwacha
    D. The exchange rate is kept the same in all parts of the market by exchange arbitrage

Use the economic data for a fictional country Sandia to answer questions 17-20.

Sandia Economic Data (billions)	
Gross Domestic Product	$ 400
Imports of Goods and Services	$ 140
Investment Spending	$ 20
Private Saving	$ 30
Exports of Goods and Services	$ 100
Government Transfers	$ 40
Government Tax Revenues	$ 140
Government Spending	$ 140
Consumption Spending	$ 280

20. Based on the data, Sandia has a current account
    A. Deficit
    B. Surplus
    C. Of Zero
    D. That cannot be determined

21. Based on the data, Sandia has a government budget balance
    A. Deficit
    B. Surplus
    C. Of Zero
    D. That cannot be determined

22. Does Sandia's data satisfy the national income identity?
    A. Yes
    B. No
    C. We have less information to verify this
    D. We have too much information to verify this

Use the information in the table below to answer question 23 - 25.

	Bread Price/loaf	Exchange Rate 23/10/2015
Zambia	ZMW 3.00	--
Botswana	BWP 4.95	0.55 ZMW/BWP
South Africa	ZAR 6.00	0.47 ZMW/ZAR

23. The purchasing power parity exchange rate between Botswana and Zambia based on the price of bread is
    A. 1.65 BWP/ZMW
    B. 1.65 ZMW/BWP
    C. 0.61 BWP/ZMW
    D. 1.82 BWP/ZMW

24. The purchasing power parity exchange rate between South Africa and Zambia based on the price of bread is
    A. 2.13 ZAR/ZMW
    B. 2.00 ZMW/ZAR
    C. 2.00 ZAR/ZMW
    D. 0.50 ZAR/ZMW

25. Based on the information in the table, the Kwacha is
    A. Undervalued relative to the BWP
    B. Undervalued relative to the ZAR
    C. Overvalued relative to the BWP but undervalued relative to the ZAR
    D. Overvalued relative to both currencies

SECTION B (75 points – 25 points each)

1. Consider the following data for a fictitious country, Mojoland.

	Cotton ginning productivity (tons/hour)	Meat processing productivity (tons/hour)	Resource endowments (hours)
Labour	$\frac{1}{3}$	$\frac{1}{2}$	L = 12000
Capital	1	$\frac{1}{2}$	K = 4800

a) Using the relevant theorem of the H-O model, show which industry will be Mojoland's exporting industry. Clearly state the theorem that you have used. **(5 points)**

b) Compute and graph the equilibrium output quantities for lint (cotton) and processed meat produced by Mojoland. **(8 points)**

c) Suppose Mojoland has a favourable immigration policy that increases the labour endowment from 12000 to 14000 person hours. What will be the equilibrium quantities for lint (cotton) and processed meat produced by Mojoland (assume here that the capital endowment and factor productivities remain unchanged)? Depict this new equilibrium on a separate graph. **(8 points)**

d) Briefly explain whether or not the change in equilibrium in part c) is consistent with the predictions of the Rybczynski Theorem. **(4 points)**

2. Country A is a "small" country in processed coffee markets. Domestic supply and demand curves in Country A are as follows:

$$S_C^A = 60 + 0.2\,P_C^A$$

$$D_C^A = 180 - 0.8\,P_C^A$$

where P_C^A is the price of processed coffee in \$/ton in Country A, and S_C^A and D_C^A are quantities in thousand tons. The price of processed coffee in Country B (representing the rest of the world) is \$100/ton.

a) If the two countries were freely trading, what would be the pattern of trade and the prevailing equilibrium price and quantity traded of processed coffee? Graph this equilibrium using the export supply and import demand diagram. **(8 points)**

b) Suppose Country A adopts the infant industry policy to support the domestic processed coffee industry. To support the industry, the Country A imposes a tariff of \$10/ton on imported processed coffee from Country B. Compute the welfare effects of this policy on all economic actors in Country A and Country B. Interpret your results and ensure to graph this tariff-ridden equilibrium on the domestic demand and supply diagram for Country A. **(12 points)**

c) After 10 years of the infant industry policy, Country A improves its efficiency in coffee processing demonstrated by the shift in the domestic supply to $S_C^A = 80 + 0.2\,P_C^A$. Assuming domestic demand remains the same and the price of coffee in Country B remains at \$100/ton, would you say the decision to protect the infant industry was justifiable? Explain your answer and show your work. **(5 points)**

3. This question focuses on exchange rate systems and models of exchange rate determination.

   a. Compare and contrast floating and fixed exchange rate systems. **(5 points)**

   b. For each of the **TWO** exogenous shocks/policy decisions outlined below, explain the effects on the following: (1) supply of Kwacha on the Zambian FOREX; (2) demand for Kwacha on the Zambian FOREX; (3) ZAR/ZMW spot exchange rate, and; (4) final adjustment of the relevant parity condition. Each exogenous shock/policy decision is characterised as a scenario. ***Be sure to first state the model of exchange rate determination you are applying to analyse each scenario. Ensure to provide graphical illustrations. Please note that ZAR and ZMW are abbreviations for the South African Rand and the Zambian Kwacha respectively.***

      i. **Scenario 1**: Key actors participating in the Zambian FOREX market expect that the ZAR/ZMW exchange rate will depreciate one year from today. **(10 points)**

      ii. **Scenario 2**: The Zambia government lifts the ban on importation of tomatoes originating from the low-priced South Africa market. **(10 points)**

------ END OF EXAM-----

UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

AGE 5241: PRINCIPLES OF FARM MANAGEMENT

2017/2018 MID-TERM EXAMINATIONS

INSTRUCTIONS:

ANSWER **ALL** FIVE (5) QUESTIONS

TIME: THREE (3) HOURS

---

1. **a.** Define the following terms: **(5 marks)**
   i. Law of diminishing marginal returns
   ii. Production function
   iii. Equal marginal principle
   iv. Partial budget
   v. Accrued expenses

   b. List and discuss characteristics of a decision that affects how much time and effort a manager devotes to making it. **(15 marks)**

2. Mr. Mulyokela can apply fertilizer in 10 kgs increments in his Kenaf field. The cost of fertilizer is K0.45/kg. Kenaf was selling for K2.50 per kg. He has one field that is a mix of Soils A and B. The field is 100 hectares with 40 hectares of Soil A and 60 hectares of Soil B. He has determined that his yields will respond according to the following table. **(20 marks)**

Fertilizer (kg/ha)	Soil A yield (kg/ha)	Soil B yield (kg/ha)
120	100	120
130	105	128
140	108	134
150	110	138
160	111	141
170	112	143

a. How much fertilizer should he apply per hectare if he fertilizes the entire field based on Soil Type A?

b. What are his profits for the entire field if he fertilizes the entire field based on Soil A?

c. How much fertilizer should he apply per hectare if he fertilizes the entire field based on Soil Type B?

d. What are his profits for the entire field if he fertilizes the entire field based on Soil B?

e. What are his profits for the entire field if he fertilizes by applying the profit maximizing amount on each soil type?

3.

Mr. Mpongo Muleya has taken a complete farm inventory and has collected the following information on the value of everything his farm owns and owes as of December 31, 2018:

Land and buildings owned K700,000	Value of breeding livestock owned..... K185,000
Value of grain in storage K130,000	Value of feeder livestock owned..... K214,000
Mortgage owed on land..... K225,000	Cash rent owed to the landlord.....K16,000
Value of machinery owned K300,000	Value of feed in storage K92,000
Loans owed on machinery K112,000	Crop production loan outstanding K59,000
Farm /property taxes owed K9,000	Value of supplies in storage K47,000
Cash on hand..... K5,000	Unpaid farm expense accounts K18,000

a. Prepare a balance sheet for Mr. Muleya as of December 31, 2018 **(16 marks)**

b. Determine whether the farm is
i) solvent
ii) liquid, using the equity to asset ratio and current ratio respectively **(4 marks)**

4. a. What kind of risk management strategies might a farm operator use to control risk during his farm operations? **(5 marks)**

b. Discuss elements or components of a risky decision. **(5 marks)**

c. Identify and discuss the three basic risk attitudes **(5 marks)**

d. What are subjective probabilities? How are they formed? How do they differ from true probabilities? **(5 marks)**

5. a. Discuss economic profitability and financial feasibility. How are they different? Why would both be considered when analysing a potential investment on your farm? **(10 marks)**

b. Solve the following

i. The value of K20, 000 to be received ten years from today at a bank rate of 20% rate of interest. **(3 marks)**
ii. The payment required on a K100, 000 loan to be repaid quarterly for 20 years at 29% rate of interest rate. **(4 marks)**
iii. The value of K50, 000 placed on a savings account at 24% interest rate for seven years compounded every three months. **(3 marks)**

UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

AGE 5241: PRINCIPLES OF FARM MANAGEMENT

2017/2018 DIFFERED EXAMINATIONS

INSTRUCTIONS:

ANSWER **ALL** FIVE (5) QUESTIONS

TIME: THREE (3) HOURS

Question one

a) Outline five reasons why small scale farmers in Zambia should keep records (5 Marks)

b) Define a production function and state three ways in which it can be illustrated (5 Marks)

c) Explain the equi-marginal principle with a clear example, showing its application in farm management. (5 Marks)

d) Explain the concept of least cost combination (5 Marks)

Question two

Mr. Ndungu runs a small hay farm in Zambezi where he grows 100 acres of grass hay. He owns a tractor, mower, and rake, but not a baler. For baling, he custom hires someone. He makes hay three times per year on the same land. On average, his yield is 5 bales (1,200 kgs each) per acre each year and he pays the custom baler K100 per bale. However, he is considering buying a baler because scheduling the custom hire is too slow and sometimes his hay gets rained on, making the price he gets lower. He currently gets K600 per ton on average for his hay. If he bought a baler, he expects to get an average price of K700 per ton as a result of having higher quality hay. The estimates for the full cost to own and maintain a baler would be K180 per bale.

a) Prepare a partial budget and determine whether Mr. Ndungu should buy his own baler or continue custom hiring. Based on your results, is buying the baler a good option (10 marks)

b) Suppose now assume to help pay for the baler, he does custom baling for a neighbor who pays him K100 per bale, and produces 5 bales per acre and hires him to bale 100 acres in a year, what would you advise Mr. Ndungu to do? (10 marks)

Question three

The following is Mr. Njovu's cash flow for the year ending 2018

Beginning checking balance K10,000	Capital purchases K35,000
Ending checking balance K15,000	Money borrowed K20,000
Gross cash farm operating income K200,000	Principal payments K22,000
Farm operating expenses (excluding debt payments) K181,000	Interest paid K17,000
Depreciation-K5,000	Withdrawals from savings K5,000
	Capital sales K50,000

a. Prepare a cash statement for him for the year ending 2018 (16 marks)

b. What were the total cash inflows (excluding the beginning cash balance) into the business? (2 marks)

c. What were the total cash outflows (excluding the ending cash balance) from the business? (2 marks)

Question 4

a) What are the sources of risk and uncertainty for farmers in your area? Which one would you rank as the most important? Why? (10 marks)
b) Explain the advantages and disadvantages of Return on Capital Employed as an appraisal tool (10 marks)

Question 5

a) What can be deduced when?
   i. An investment is discounted at 20% and its net present value is zero? (2)
   ii. An investment is discounted at 15% and produces a net present value of K34, 000, 000. (2 marks)
   iii. A farm investment is discounted at 22% and produces a net present value of – K24, 000 (2 marks)

b) Solve the following
   i. The value of K20, 000 to be received ten years from today at a bank rate of 20% rate of interest. (3 marks)
   ii. The payment required on a K100, 000 loan to be repaid quarterly for 20 years at 29%nrate of interest rate. (4 marks)
   iii. The value of K50, 000 placed on a savings account at 24% interest rate for seven years compounded every three months. (3 marks)

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

BACHELOR OF FOOD SCIENCE AND TECHNOLOGY

FUNDAMENTALS OF ELECTRICAL ENGINEERING FOR FOOD SCIENCE

AGF 2251

2017-2018 DEFERED EXAMINATIONS

DURATION: THREE (3) HOURS **VENUE: SPORTS HALL**

INSTRUCTIONS TO THE CANDIDATES:

1. PLEASE READ THE INSTRUCTIONS AND EACH QUESTION CAREFULLY.
2. THIS PAPER HAS **FOUR** QUESTIONS AND EACH CARIES **25 MARKS**
3. ANSWER ALL QUESTIONS.

QUESTION 1 [25 points]

(a) A wire of length 2m and another wire of length 5m are made up of the same material and have the same area of cross section, which wire has higher resistance? Justify your answer. (5 points)

(b) What happens to the current in the series circuit if the resistance is doubled? (5 points)

(c) Give a summary of how electricity is transmitted from the point of generation to establishments (homes, business houses and food factories). (5 points)

(d) Describe in summary how electricity is generated from a geothermal source. (4 points)

(e) Define the following electrical engineering terms:

(i) Charge (2 points)

(ii) Kilowatt hour (2 points)

(iii) Voltage (2 points)

QUESTION 2 [25 points]

a) Calculate the power across each 20 ohms rectangular heating coils of a double effect evaporator **(circuit in Figure 1)** used to concentrate pineapple juice. (6 points)

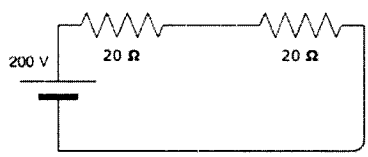


Figure 1

b) Two mini batch milk pasteurizers with elemental resistance of 20 and 10 ohms are connected in the circuit given in **Figure 2.** Calculate the energy dissipated by each element if the pasteurizers run for 2 hours. (6 points)

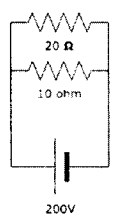


Figure 2

c) Calculate the equivalent resistance between point A and B in the circuit given in **Figure 3.** (7 points)

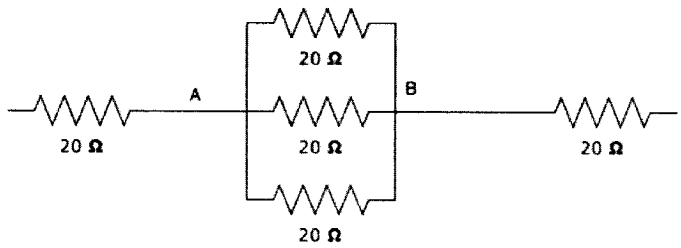


Figure 3

d) What is the value of x if the current in the circuit **(Figure 4)** is 5A? (6 points)

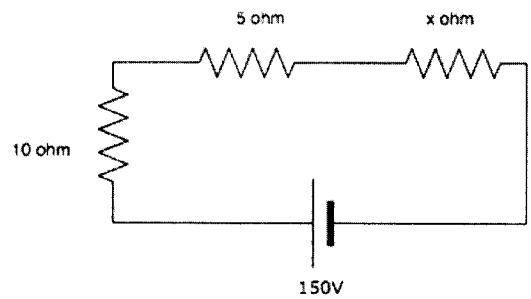


Figure 4

QUESTION 3 [25 points]

a) Briefly describe the working principle of the transformer (6 points)

b) A transformer has 500 turns of the primary winding and 10 turns of the secondary winding.

(i) Determine the secondary voltage if the secondary circuit is open and the primary voltage is 120 V. (3 point)

(ii) Determine the current in the primary and secondary winding, given that the secondary winding is connected to a resistance load 15 Ω? (4 points)

(iii) Give two factors that determine the strength of the magnetic field induced into the soft iron core of the transformer. (2 point).

(iv) Give three practical applications of a transformer? (6 points)

(v) Why is it necessary to know the turns ratio of a transformer? (4 points)

QUESTION 4 [25 points]

a) Electric motors are very important machines that have found widespread application in the food industry.

(i) Describe five components of a typical electrical motor. (5 points)

(ii) Give one key difference between the synchronous and asynchronous motors (5 points)

(iii) List five factors that may cause burning out of electric motor in the food industry operations (2.5 points)

(iv) Give five examples of mechanical drive operations in the food industry that are aided by an electrical motor (2.5 points)

b) The four steam boiler used as a heat source in the continuous pasteurizer is shown in **Figure 5**. The ground rules for the plant operation are as follow:

- The plant will operate 10 hrs./day, 7 days/week, 350 days per year
- Electricity is available on site the current tariffs for Imuka Energy Ventures (IEV) is ZMW 1.5/KWh

Calculate the annual electrical energy cost that your company needs to pay IEV according to this design (10 points)

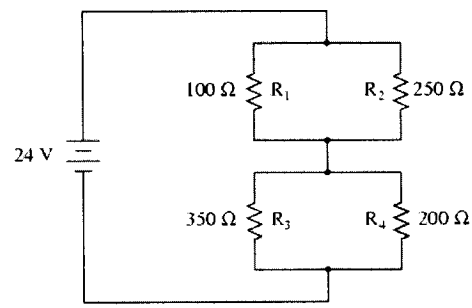


Figure 1. Four elemental boiler system

THE UNIVERSITY OF ZAMBIA
School of Agricultural Sciences
Department of Food Science and Nutrition

INTRODUCTION TO INFORMATION TECHNOLOGY AND COMMUNICATION
AGF 2401

2017-2018 DEFERRED EXAM

Date: 28th December, 2018
Venue: Sports Hall
Time: 09.00 – 12.00 hrs
Duration: 3 Hours

Instructions

1. This exam has one section
2. Answer any five questions. Each question carries 20 Marks.

Section A

Answer any five questions. Each question carries 20 marks

Question 1

1. Every day, people around the world rely on different types of computers. List and explain any five (5) different types of computers? [10]
2. List and describe any five input devices? [5]
3. What is a Computer System? [2] What is the difference between Software and Hardware with examples? [3]

Question 2

1. List the three different categories of storage media? [3] Explain any one storage media with examples? [3]
2. What is the difference between CD-R/DVD-R and CD-RW/DVD-RW[4]
3. Explain the five generations of a computer? [10]

Question 3

1. Explain how ICT is used in the following sector
    i. Education [2]
    ii. E-Commerce [2]
    iii. Healthcare [2]
    iv. Industry [2]
    v. Banking [2]
2. Give some guidelines on using E-mail and Internet Usage? [5]
3. In the advancement of ICT, it is easy for anyone to retrieve your information from the Internet. Your information may be exposed and stolen. List some unethical computer code of conducts? [5]

Question 4

1. Define computer security? What are the different types of computer security? [6]

2. In order to make sure your computer is secured, what are the computer security list you need to follow? [4]

3. List and explain any five malicious code that affects the computers? [10]

Question 5

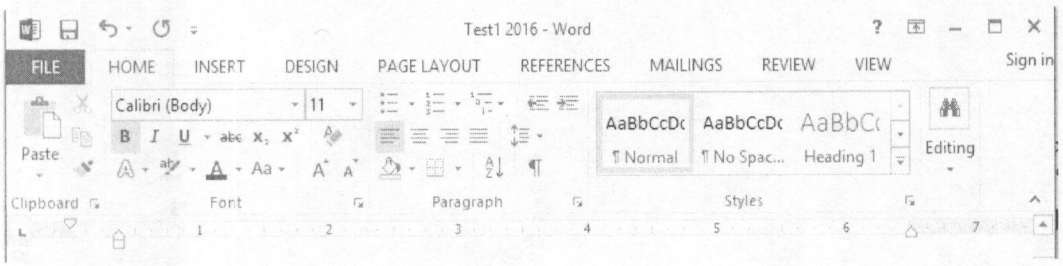
1. Today, people rely on computers to create, store and manage critical information. It is important that the computer and the data they store are accessible and available when needed. It is also important that users take measures to protect their computers and data from lost, damage and misused.

   Explain different types of security measures that protect your computer and data? [10]

2. List and describe different types of Printers? [10]

Question 6

1. You are required to do a number of tasks in Microsoft Word and when you open Microsoft the following window opens. Explain which menu you will select to do the following tasks.**[5].**



   i. Find and Replace

   ii. Cover Page

   iii. Read Mode

   iv. Format Painter

   v. Word Count

2. List out any 6 items and briefly explain when you click the Insert menu? [6]
3. What are the difference between footnote and endnote? [2]
4. What are the difference between font color and text highlight color? [2]
5. Give some advantages of using word processing software? [5]

Question 7

1. Explain the any five layouts used in the PowerPoint? [10]
2. Write down any five advantages of using presentation software? [5]
3. Explain the briefly the following term that what function it will do in MS PowerPoint? [5]

i. Slide Sorter

ii. Transitions

iii. Animations

iv. Slide Show

v. Handout Master

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE AND NUTRITION

2018 ACADEMIC YEAR – FINAL DEFERRED EXAMINATIONS

COURSE: AGF 5432
Food Safety and Quality Management

Date: Friday, 28th December 2018 **Time: 14.00 – 17.00 Hours**

Duration: THREE (3) HOURS **Venue: Sports Hall**

INSTRUCTIONS TO CANDIDATES:

1. There are five (5) questions in this examination paper.
2. **Answer all questions in this examination paper**
3. Each question carries 20 marks giving a total of 100 marks for this examination paper
4. The marks allocated are given at the end of each question.

Questions 1

a) What do you understand by the following terms in food safety and quality management:

i. Codex Alimentarius Commission ***[2 marks]***

ii. COP ***[2 marks]***

iii. Quality Assurance ***[2 marks]***

iv. Precautionary principle in the SPS Agreement ***[2 marks]***

v. Legal metrology ***[2 marks]***

b) Answer the following questions (brief answers):

(i) State two main food safety related Acts (Zambians Laws) in the Zambian Food Safety System and briefly state their main objective in relation to food safety ***[2 marks]***

(ii) State the first two core stages of the seven (7) core stages, which are also known as principles of a HACCP plan ***[2 marks]***

(iii) The table below shows three-class attribute plans for ice cream according to the Canadian sampling plans. Explain the meaning of Aerobic Plate Count (APC) in ice cream as given in the table below.

Product	Organisms	Plan class	N	m	M	c	Source
Ice cream	APC	3	5	10^5	10^6	2	Canada
Ice cream	Coliforms	3	5	10	10^3	1	Canada

[2 marks]

(iv) State the 4 stages in a chemical risk assessment ***[2 marks]***

(v) State three (3) major standard setting bodies in relation to international food safety systems, and in a sentence for each, give the key roles they play in that system ***[2 marks]***

QUESTION 2

A medium sized food processing company approaches you with a view to develop a HACCP plan for its growing company. Write a short report with brief explanations on how they should conduct the six (6) preliminary stages that they will have to undergo in order to develop a HACCP plan for their company ***[20 marks]***

QUESTION 3

There are eight broad areas covered by the Codex General Principles of Food Hygiene promulgated by the Codex Alimentarius Commission, that require practical implementation to achieve GMPs in a food chain of a given food sector or food industry.

(a) Apart from that already stated in 3(b) below, state any other five (5) of the broad areas that a food chain needs to implement to ensure GMPs ***[5 marks]***

(b) One of the important specific areas among the eight broad areas is the Control of Operations in the food chain. Mention five (5) important broader aspects of the Control of Operations that are important in ensuring GMPs in an establishment. Briefly, explain each of the five aspects with an aid of an example for each.

[15 marks]

QUESTION 4

Discuss how an integrated food chain surveillance (one of the foodborne disease surveillance system levels), clearly reveals the muti-disciplinary or inter-disciplinary nature of a food safety system ***[20 marks]***

QUESTION 5

The quality management system is explained based on the process approach of the plan-do-check-act (PDCA) cycle. The factors important to the implementation of the quality management system can be split into two major sets of factors, namely, those that are external to the organization and those that are internal to the organization. One of the major or main internal factors is performance evaluation of the organization. In the performance evaluation factors, one important aspect to consider is the monitoring, measurement, analysis and evaluation of customer satisfaction to ensure proper QMS. State and briefly explain five (5) methods of monitoring customer satisfaction

[20 marks]

END

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE & NUTRITION

BSc HUMAN NUTRITION PROGRAMME

AGN 4321: RESEARCH METHODS AND EPIDEMIOLOGY FOR NUTRITIONISTS

2017 / 2018 Academic year deferred examination

Date: Thursday 27th December, 2018 **Time: 14.00 – 17.00 Hours**

Duration: THREE (3) HOURS **Venue: Sportshall**

INSTRUCTIONS TO THE CANDIDATE:

1. This paper consists of Section A (40 Marks) and Section B (60 Marks). Answers to each QUESTION should be on a separate page
2. answer ALL questions
3. Each question is allocated marks as shown in parenthesis

SECTION A (40 MARKS)

1. Define what ecological studies are and provide two strengths of ecological studies, **(5 marks)**

2. Distinguish between stratified random sampling and quota sampling. **(3 marks)**

3. Highlight the steps involved in the research process **(8 marks)**

4. What is the purpose of adding citations and references to your research? **(4marks)**

2) In a prospective study of tea consumption and Coronary Heart Disease, intake of 5 or more cups of tea per day was associated with Relative Risk (RR) of 1.35 (95% CI, 1.12 to 1.9). Stratifying the data by smoking status the results were as follows: smokers RR=1.3 (95% CI, 0.50 to 1.6) and Non-smokers RR 0.74 (95% CI, 0.40 to 1.12).

Interpret both the stratified and un-stratified results of the above study **(9 marks)**

Describe the effect of smoking on the results **(2 marks)**

3) Results from the most recent Zambia STEPS Survey (2017) conducted by WHO and Ministry of Health indicates that 10% of adults aged 18-69 are not physically active (Having < 150 minutes of moderate-intensity activity per week, or equivalent). The STEPS results also demonstrate an increase in overweight and obesity in the same age group. Describe reverse causality using the STEPS results above. **(5 marks)**

4) Differentiate the following terms used in Nutritional Epidemiology:

Systematic review and meta-analysis **(4 marks)**

SECTION B (60 MARKS)

Question 1:

(a) Define cluster sampling, and state the difference between one-stage and two-stage cluster sampling **(5 marks)**

(b) When is it suitable to conduct a randomised control trial? **(5 marks)**

(c) When is it unethical to conduct a randomised control trial? **(5 marks)**

Question 2:

(a) Highlight the differences between Experimental and Observational studies, giving one example of each **(8 marks)**

(b) Describe the two classifications of experimental study designs **(7 marks)**

Question 3:

Bradford-Hill criteria for causation are intended to guide epidemiologic investigations and aid in causal inference. One of the most studied public health problem is cancer. In nutritional epidemiology, evidence has shown that eating processed meat causes colorectal cancer. In relation to finding that eating processed meat cause colorectal cancer, discuss any five Bradford-Hill criteria. (Apply the principles to the example) **(15 marks)**

Question 4:

Confounding can lead to erroneous conclusions about the relationship between the independent and dependent variables. In research confounding can be controlled at two levels, identify and briefly describe the two levels with their respective approaches for dealing with confounding variables. **(15 marks)**

END OF EXAMINATION

UNIVERSITY OF ZAMBIA
UNIVERSITY END OF YEAR DEFERRED EXAMINATIONS-DECEMBER 2018

AGS 5511: AGRICULTURAL HYDRAULICS AND IRRIGATION DESIGN

Time: Three (3) Hours **Total Marks:** 100
Instruction: Answer all Questions

Question 1

A project site is located close to Mt. Makulu Research Station, the meteorological data of which served as a basis for the calculation of the reference crop evapotranspiration (ETo). The values of ETo, based on Penman-Monteith Equation are given in Table 1 below. the results using the Penman-Monteith Equation, which will be used in this example, are given in mm/day. A field with heavy clays on the project site, was prepared and planted with maize crop on 15th October.

Table 1: Monthly ET_o for Mt. Makulu Research Station

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ET_o (mm/day)	4.3	4.1	4.2	3.9	3.3	2.9	3.2	4.2	5.5	6.2	4.9	4.3

i. Estimate the crop evapotranspiration for the maize crop **[5 marks]**
ii. Calculate the ETc during the month of peak demand **[5 marks]**
iii. What is the average daily ETC for the maize crop? **[5 marks]**
iv. Explain the concept of peak water requirements? **[5 marks]**

Extra Information

Table 2: Single (time-averaged) crop coefficients and mean maximum plant heights for non-stressed, well-managed crops in sub humid climates for use with the FAO Penman-Monteith ETo

Crop	Kc initial	Kc mid	Kc end	Crop height (h) (m)
Maize - field grain (field corn)		**1.20**	**0.60**	**2**

Question 2

a) When designing an irrigation system, the first thing to determine is how much water will be needed for the season. Explain how you would calculate the water amount to be delivered by the irrigation system. **[12 marks]**

b) What are the factors that influence the amount of water for irrigation to be abstracted at the pump station? **[8 marks]**

Question 3

When choosing the right pump for an irrigation system one of the principles or things to consider is the total dynamic head (TDH) also called the total pumping head.

i. With the aid of sketches, explain what TDH is for:

   a. Pump below water level **[4 Marks]**

   b. Pump above water level **[4 Marks]**

ii. Explain the following terms as used in explaining TDH:

   a. Static suction head

   b. Static discharge head

   c. Total static head

   d. Friction head

   e. Pressure head

   f. Velocity head **[12 Marks]**

Question 4

The design process of a sprinkler irrigation system is divided into 11 steps in order that it is orderly:

i. List the eleven steps **[6 Marks]**

ii. For each of the 11 steps, explain the activities that are done? **[14 Marks]**

Question 5

When pumping water through an irrigation system, the water passes a number of irrigation systems sections, from the pump up to the sprinkler. The system is divided into 5 sections.

i. Name these five sections **[5 Marks]**

ii. What does each of the five sections do? **[5 Marks]**

iii. What equipment is involved in each section? **[5 Marks]**

iv. What principles must you as a designer adhere to, in each of the five steps? **[5 Marks]**

End of Exam

Wishing you a Merry Xmas and happy 2019!!!

Figure 19

Average $K_{c\ ini}$ as related to the level of ET_o and the interval between irrigations and/or significant rain during the initial growth stage when wetting events are light to medium (3–10 mm per event) for all soil types (Source: FAO, 1998a)

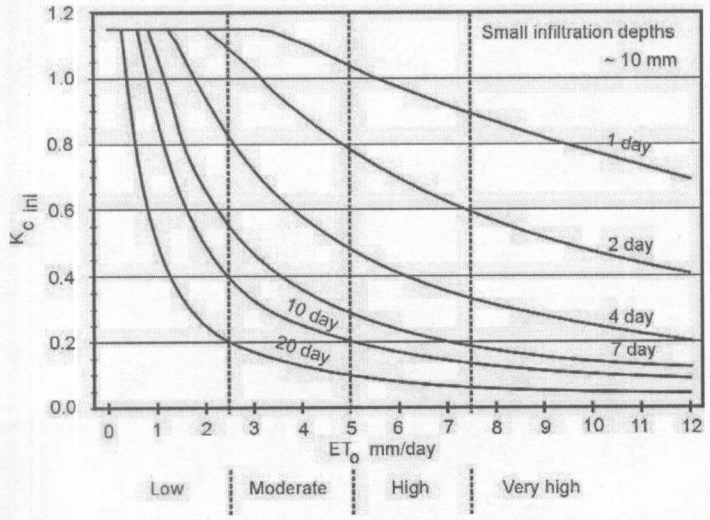
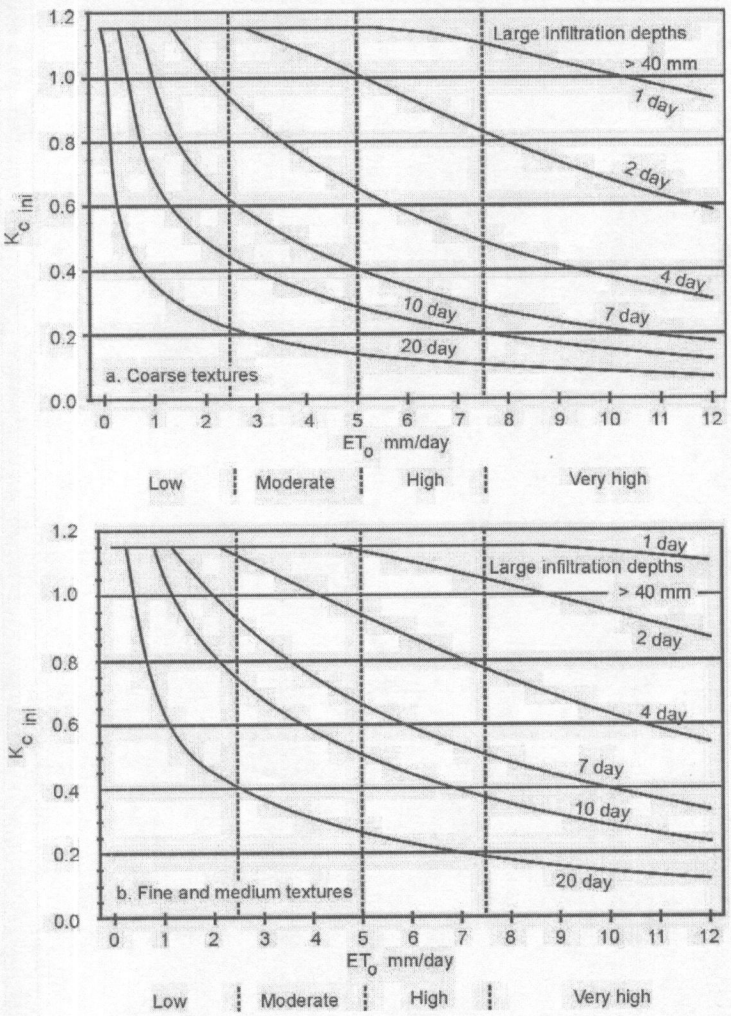


Figure 20

Average $K_{c\ ini}$ as related to the level of ET_o and the interval between irrigations greater than or equal to 40 mm per wetting event, during the initial growth stage for a) coarse textured soils; b) medium and fine textured soils (Source: FAO, 1998a)



UNIVERSITY OF ZAMBIA

DEFERRED EXAMINATIONS-2018

AGS 5411: SOIL MICROBIOLOGY

Time: Three (3) Hours **Marks: 100**

Instructions: Answer all Questions

1. The study of soil microbes is not only concerned with the size of the organisms but also the techniques used for study. Explain the following procedures for isolating and studying soil microbiota:
    a. Direct Isolation **[5 marks]**
    b. Enrichment cultures **[5 marks]**
    c. Direct plating **[5 marks]**
    d. Gram stain **[10 marks]**

2. Oxygen is an important element that determines the rates, efficiencies and types of biological processes. Explain how oxygen affects the following processes
    a. Nitrification **[5 marks]**
    b. Symbiotic nitrogen fixation **[5 marks]**
    c. Denitrification **[5 marks]**
    d. Mineralization **[5 marks]**

3. Soil phosphorus is an important plant and microbial nutrient. Its availability in soils is influenced by many factors. Explain the following soil P transformation processes:
    a. Mineralization **[7.5 marks]**
    b. Solubilization **[7.5 marks]**

4. Mathematical models that predict the growth of bacteria such as *Salmonella* are useful tools in bacteriology.
    a. Design an experiment that can be used to monitor bacterial population growth **[4 minutes]**.
    b. Given that *Salmonella* sp has a generation time of 30 minutes, calculate the number of generations for the population to increase a hundred times from an initial population of 10^3 cfu/ml assuming that the bacterium in question replicates by binary fission **[4 marks]**.
    c. Illustrate and write brief notes on all the phases of a typical growth curve **[12 marks]**.

5. Humification is the sum of all the process involved in the decomposition of organic matter and leading to the formation of humus.
    a. What are the different classes of humus that you know? **[10 marks]**
    b. Briefly describe the synthesis phase of humification **[6 marks].**
    c. Based on nutrition and with examples, what are the major classes of organisms that are important in the process of decomposition? **[4 marks]**

THE UNIVERSITY OF ZAMBIA

DEFERRED EXAMINATIONS – DECEMBER 2018

AGS 5121

SOIL GENESIS AND CLASSIFCATION

TIME: **THREE HOURS**

INSTRUCTIONS: **ANSWER ALL QUESTIONS**

1. a. Present at least five (5) reasons why we classify soils

   b. What are the unique characteristics of the USDA Soil Classification System and the World Reference Base for Soil Resources

   c. Explain with examples the application of soil classification in soil research and agrotechnology transfer

2. What are the major soil forming processes involved in the formation of the following diagnostic horizons:

   a. Mollic epipedon

   b. Anthropic epipedon

   c. Spodic horizon

   d. Argillic horizon

   e. Oxic horizon

3. A soil is classified as: Fine, montmorillonitic, isohyperthermic, chromudert:

   a. Present its chemical, physical and biological properties.

   b. What are its fertility attributes beneficial to arable cropping.

   c. What the management challenges in arable cropping in this soil.

   d. Suggest a management package for optimizing arable land productivity.

4. Present the major characteristics of the following soils and suggest a package of remedial measures for arable cropping for each one of them:

   a. Natrustalf

   b. Duriaquods

   c. Plinthudults

   d. Calciusterts

   e. Eutrustox

5. Using montmorillonite as the example, explain how mineralogy affects soil chemical, physical and biological properties

6. a. What are the major soil forming processes in agro-ecological zone III of Zambia and the resultant chemical, physical and biological soil fertility

   b. Give at least five (5) interventions for improving land productivity in agro-ecological zone III of Zambia

   c. Explain why livestock production is limited in agro-ecological zone III of Zambia

7. Hans Jenny (1941) presented a conceptual model of 5 soil forming factors.

   a. Least these soil forming factors and briefly explain how they contribute to soil formation

   b. What are the weaknesses of this model of soil formation?

8. What is a catena? Discuss the relevance of this concept in soil science

9. To which of the 4 soil forming processes do the following situations apply?

   a. Saltation

   b. Resilication

   c. Melanization

   d. Argillipedoturbation

   e. Lessivage

   f. Leaching

   g. Podzolization

h. Sedimentation

i. Eluviation

j. Braunification

UNIVERSITY OF ZAMBIA

UNIVERSITY DEFFERED EXAMINATIONS – DECEMBER, 2018

AGS 3711: AGROCLIMATOLOGY

Time: Three (03) Hours

Instructions: Answer All Questions

Total Marks: **100**

Non-programmable calculators are allowed

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1. Define the following terms. **[15 Marks]**

a. Saturation vapor pressure

b. Shortwave radiation

c. Radiative forcing

d. Tropopause

e. Weather

f. Atmosphere

2. Meteorological data has a wide range of applications in various fields. **[25 Marks]**

a. Discuss applications of weather data in agriculture **[5 Marks]**

b. Discuss some of the uses of weather data for non agricultural purposes **[7 Marks]**

c. Give an outline of a standsrd meteorological station. **[5 Marks]**

d. Outline the weather parameters that can be measured at such a station and how weather instruments would be laid out to obtain such measurements. **[8 Marks]**

3. A farmer obtained meteorological parameters of Lusaka, 15.5° S and 28.5° E, for 1st November 2017 from a meteorological station near his farm as shown in a table below. **[20 Marks]**

Parameter	
Daily maximum air temperature	34 °C
Daily minimum air temperature	20 °C
Daily mean relative humidity	50 %
Expected clear sky shortwave radiation	25 MJ m^{-2} d^{-1}
Shortwave radiation	21 MJ m^{-2} d^{-1}
Average wind speed at 2 m	3 m s^{-1}
Pan evaporation	7 mm
Surface albedo	0.3
Air pressure	96 kPa

Calculate the following,

a. Mean saturation vapor pressure
b. Actual vapor pressure
c. Net shortwave radiation
d. Net long wave radiation
e. Net radiation

4. Agriculture production is said to have been highly impacted by climate change. **[25 Marks]**

   a. What do you understand by climate change? **[2 Marks]**

   b. Describe a methodology of how one can go about ascertaining whether the climate of an area has changed or not. **[6 Marks]**

   c. Discuss at least five expected impacts of climate change on agriculture in Zambia. **[10 Marks]**

   d. What measures has the government of Zambia put in place to reduce the impacts of climate change on agriculture? **[7 Marks]**

5. Write short notes on the following; **[15 Marks]**

   a. Calculation of reference evapotranspiration **[5 Marks]**

   b. Effects of radiation on plants **[5 Marks]**

   c. Agroecological regions of Zambia **[5 Marks]**

END OF EXAMINATION