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UACE P515/2 Principles and practices of agriculture 2008

3 hours

Instructions

- This paper consists of sections: **A, B, C, D and E**
- Answer **question 1** in section A and four other questions, selecting **one** from each of the sections **C, D and E**.
- Write your answers in the answer booklets provided
- Any additional question(s) answered will not be marked

SECTION A (20 MARKS)

Question 1 is compulsory

1. Table 1 shows the effect of water table level on the oxygen content of soil air, the yield of cotton and the plant uptake of nitrogen, phosphorus and potassium

Table 1

Depth of water table (cm)	Oxygen content at soil depth of 23cm (%)	Yield of cotton (g)	Nutrient uptake by 5 plants (mg)		
			S	P	K
10	1.6	57	724	85	1091
60	8.3	108	1414	120	2069
90	13.2	157	2292	157	3174

- (a) From the table, explain the effect of depth of water table on
- (i) Oxygen content of soil air (05marks)
 - (ii) Nutrient uptake by the plants (05 marks)
 - (iii) Yield of cotton (07 marks)
- (b) From the table, suggest the effect of low depth of water table on the appearance of cotton plants. Explain your answer

SECTION B (20MARKS)

CROP PRODUCTION

Answer **one** question from this section

2. (a) Explain the importance of processing agricultural products. (10marks)
(b) Describe the wet method of processing coffee. (10marks)
3. (a) Explain the factors that affect the level of organic matter in the soil. (10marks)
(b) Outline the importance of organic matter in the soil

SECTION C (20MARKS)

ANIMAL PRODUCTION

Answer **one** question from this section

4. (a) Outline the factors that should be considered when establishing a beef herd. (06marks)
(b) Explain the measures government should take to improve beef production in the country.
(09 marks)
(c) Explain why local breeds of cattle have been more successful in the tropics than exotic breeds
(05 marks)
5. (a) Outline the conditions that encourage each of the following, in a laying flock
 - (i) Vices (05 marks)
 - (ii) Stress (05 marks)
(b) Describe the process of egg formation in a hen. (10marks)

SECTION D (20MARKS)

AGRICULTURAL ENGINEERING

Answer **one** question from this section

6. (a) Explain how lubricating helps running of machines. (06marks)
(b) Describe the working of the force-feed type of lubricating system. (08 marks)
(c) How would you ensure the proper functioning of a lubricating system?
7. (a) Using illustrations, describe the induction stroke and the compression stroke of a four-stroke cycle spark ignition engine. (10marks)

(b) Outline ways in which a two-stroke engine differs from a four-stroke engine

SECTION D (20MARKS)

AGRICULTURAL ECONOMICS

Answer **one** question from this section

8. (a) Using an illustration, explain how market price is determined in a competitive market. (07marks)
(b) Describe the effect of fluctuation in the prices of agricultural products. (09marks)
(c) What measures can government adopt to stabilize prices of agricultural products? (04marks)
9. (a) Distinguish between:
(i) Variable costs and fixed costs (06 marks)
(ii) Opening valuation and closing valuation. (04marks)
- (b) The following is a list of Mr. Kato's financial transactions in the year, 2000.

	Shs
Coffee sale	70,000
Sale of sheep	3,000
Closing valuation	150,000
Purchase of fertilizer	60,000
Veterinary bills	3,000
Milk sale	30,000
Wages	24,000
Opening valuation	121,000
Interest payable	6,500
Depreciation of machinery	7,000
Purchase of hoes	700
Construction of crush	2,500

Prepare a trading account for Mr. Kato as on 31/12/2000 from the information provided (10marks)

END

Suggested answers

1. Table 1 shows the effect of water table level on the oxygen content of soil air, the yield of cotton and the plant uptake of nitrogen, phosphorus and potassium

Table 1

Depth of water table (cm)	Oxygen content at soil depth of 23cm (%)	Yield of cotton (g)	Nutrient uptake by 5 plants (mg)		
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10	1.6	57	724	85	1091
60	8.3	108	1414	120	2069
90	13.2	157	2292	157	3174

- (a) From the table, explain the effect of depth of water table on
- Oxygen content of soil air (05marks)
Increase in the depth of water table, increases the amount of oxygen in the soil because of decrease in the amount of water in the soil create space for air. But the oxygen content increases at decreasing rate because the soil gets compacted at high depth
 - Nutrient uptake by the plants (05 marks)
Increase in the depth of water table, increases uptake of mineral nutrients because it increases the amount of oxygen in the soil and the rate of respiration. This provides energy for active uptake of nutrients.
 - Yield of cotton (07 marks)
Increase in the depth of water table, increases cotton yield because
 - increased uptake of mineral nutrients required for growth and development of cotton plants.
 - increase in oxygen concentration with depth promotes health growth of roots promoting absorption of water
 - Presence of oxygen in air promotes nitrogen fixation
 - Improved pH
 - Less incidence of fungal disease
- (b) From the table, suggest the effect of low depth of water table on the appearance of cotton plants. Explain your answer (03marks)
Stunted growth, reduced root growth and expansion, chlorosis, distorted leaf shapes due to low mineral uptake and denitrification caused by waterlogging, and unfavorable pH

SECTION B (20MARKS)

CROP PRODUCTION

Answer **one** question from this section

2. (a) Explain the importance of processing agricultural products. (10marks)
- adding value to agricultural products for instance turning into tomato sauce
 - increase self-life
 - lower transport costs to the market

- enable attractive packaging
 - promote standardization of agricultural products
 - increases marketability of agricultural products
 - creates employment
 - reduce postharvest losses
 - increase farmer's income
- (b) Describe the wet method of processing coffee. (10marks)
- Involves getting the parchment of the coffee cherry (fruit) by first removing the pulp from the green coffee inside or moist soft dry coffee
 - Then the beans are placed into a fermentation tank to remove coffee cherry's mucilage
 - It is washed, dried to a moisture content of about 10% and then land sorted (graded) for sale
3. (a) Explain the factors that affect the level of organic matter in the soil. (10marks)
- High plant and animals residues increase organic matter level in the soil.
 - High soil temperature increases the rate of decomposition lowering the level of organic matter in the soil
 - Soil water promotes the rate of decomposition of organic matter lowering the level of organic matter in the soil
 - High soil clay content
 - Presence of putrefying organisms; for instance sterilizing soil with heat delays decomposition maintaining high level of organic matter in the soil.
 - Soil aeration: adequate oxygen in the soil encourages growth of microorganism and promotes decomposition, lowering the level of organic matter in the soil.
 - Soil pH between 6 and 8 promotes growth of microorganisms and thus promotes decomposition, lowering the level of organic matter in the soil
 - Pollution kills microorganisms and delays the rate of decomposition
 - Climatic factors such as rainfall that provides water necessary for rotting, lowering the level of organic matter in the soil
 - Agricultural practices such as mulching increases organic matter in the soil (10 marks)
- (b) Outline the importance of organic matter in the soil
- Provides food and shelter for soil living organism
 - Source of plant nutrients
 - Buffers soil pH
 - Binds soil particles together improving soil structure
 - It increases the soil CEC
 - Reduce soil erosion because it binds soil particles together
 - Provide attachment sites for mineral ions
 - Improves air movement and water retention
 - Releases acids during decomposition which help in weathering.

SECTION C (20MARKS)

ANIMAL PRODUCTION

Answer **one** question from this section

4. (a) Outline the factors that should be considered when establishing a beef herd. (06marks)
- Availability of land
 - Availability of water for animals
 - Availability of pasture
 - Availability of market for beef animals
 - Availability of extension services to give veterinary advice
 - Availability of capital to purchase necessary facilities and animals
 - Access to quality breeds
 - Adaptability of animals to local conditions
 - Fertility rate of the animals
 - Pest and diseases
 - Availability Labor
 - Security
 - Government policy and support to animals sector
- (b) Explain the measures government should take to improve beef production in the country. (09 marks)
- Introduction of quality beef breed
 - Upgrading local breeds through cross breeding
 - Improved veterinary extension services
 - Education of the farmer on livestock management
 - Supplementing local feeds
 - Increasing water access in the grazing/dry areas
 - Reducing insecurity in the country
 - Providing cheap agricultural credit
 - Promoting research
- (c) Explain why local breeds of cattle have been more successful in the tropics than exotic breeds (05 marks)
- They are resistant to high temperature
 - They are resistant to pest and disease
 - Can walk long distances in search of water and pasture
 - Have few reproductive problems
 - Can service on poor quality pasture
5. (a) Outline the conditions that encourage each of the following, in a laying flock
- (i) Vices (05 marks)
- Heredity: some line of birds show more vices like cannibalism than others.

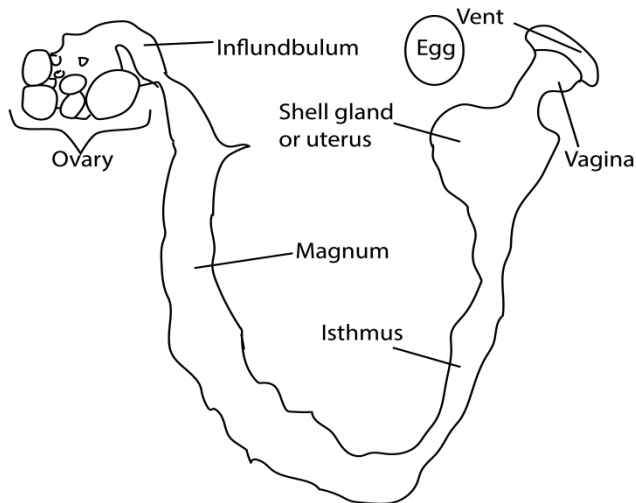
- overcrowding in the poultry houses can cause vices like cannibalism as birds become more close to each other
- Introduction of new birds in a flock with unique characters of the body and size may cause cannibalism and feather pecking.
- Exposure of wounds and smell of blood can cause cannibalism
- Lack of enough laying boxes which causes breakage of eggs and exposes eggs to the birds can easily result into egg eating.
- Improper feeding of the birds that encourages mineral deficiency can lead to cannibalism
- Bright light in the poultry house can stimulate feather and toe pecking.
- Insufficient drinking and eating place may also lead to pecking as birds struggle to get near to feeds and water.
- Irritation of the skin through direct sunlight and lice infection can result into cannibalism and pecking.
- Diseases like gumboro can easily cause cloaca pecking since the droppings usually stick in that area.
- Introduction of birds that are moulting (shedding feathers) in a flock can easily encourage cannibalism due to exposure of bare skin to other birds

(ii) Stress (05 marks)

- Change of feeds i.e. from layers mash to growers mash
- Change of feeding routine
- Starving birds or inadequate feeding
- Vaccination of birds leading to pain
- Debeaking birds
- High temperatures in the poultry house
- Presence of parasites on the birds
- Overcrowding in poultry house
- Change of the environment around the birds i.e. moving birds to a new place
- Noise of predators around the poultry house

(b) Describe the process of egg formation in a hen. (10marks)

Reproductive system of hen where an egg is formed



It comprises of the following: ovary, infundibulum, magnum, uterus, vagina, and isthmus.

- Ovum is produced by the ovary
- Fertilization and formation of yolk sac takes place in the infundibulum in about 15 minutes
- Albumen and chalaza are formed in magnum in about 3 hrs
- About 10% albumen and egg membrane are formed in isthmus in about 1 hr and 15 minutes
- **Uterus / shell gland:** in this place the outer calcium shell is added to the egg and 45% of the albumen is also added. The egg spends 18-22 hrs while here.
- **Vagina:** the egg is inverted in this place and vaginal fluid is secreted to reduce friction. The egg spends about one minute before moving to the cloaca.

SECTION D (20 MARKS)

AGRICULTURAL ENGINEERING

Answer **one** question from this section

6. (a) Explain how lubricating helps running of machines. (06 marks)
- reduce friction and loss of energy
 - reduce machine wear and tear
 - reduce over heating
 - reduce running noise
 - reduce maintenance costs
 - slow braking
 - prevent stationary machine from running
- (b) Describe the working of the force-feed type of lubricating system. (08 marks)

Here a pump circulates lubricating oil through a cooler and filter to a distribution system that directs the oil to all the bearings and crosshead shoes.

The lubricator plates provides direction for adjusting the flow of oil

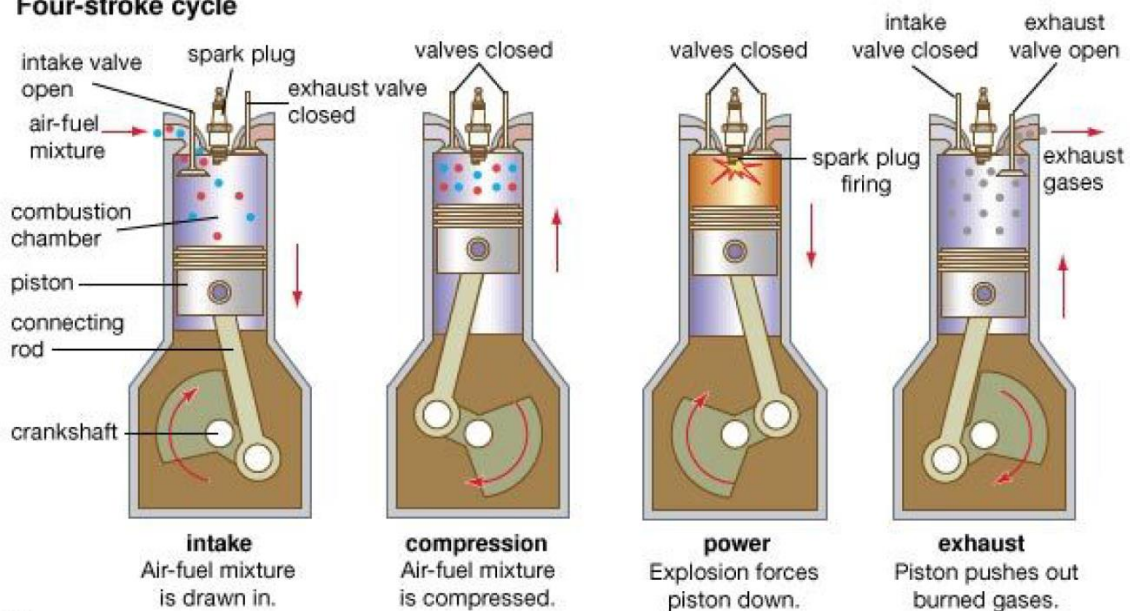
(c) How would you ensure the proper functioning of a lubricating system?

- Use the correct type of lubricant for particular system
- Store the lubricant in a cool dry place
- Avoid contamination of lubricant with dust and dirt
- Follow manufacturers instruction on the quantity of lubricant required
- Re-evaluate the lubrication in case of change of operation
- Routine lubrication
- Use clean dispensing equipment
- Use efficient application tools
- Ensure that parts to lubricate are clean
- Clean oil spillage

7. (a) Using illustrations, describe the induction stroke and the compression stroke of a four-stroke cycle spark ignition engine. (10marks)

- In a four-stroke engine each piston is equipped with at least two valves, one to admit air or air-fuel mixture and the second to exhaust spent gases after ignition.
- The opening and closing of these valves is mechanically synchronized with the movement of the piston backwards and forward.
- The four –stroke cycles derives its name from the four identifiable movements of the piston in the chamber, two of expansion and two of compression, for each full power cycle:

Four-stroke cycle



- Intake stroke: the intake valve is open, fuel –air mixture is drawn in with a downward stroke
- Compression stroke: as the piston moves upwards, the fuel-air mixture is compressed
- Power stroke: after the fuel is compressed, it is ignited to produce the engine power
- Exhaust stroke: the exhaust valve opens and the exhaust gasses exit the cylinder

(b) Outline ways in which a two-stroke engine differs from a four-stroke engine (04marks)

- A four-stroke engine goes through four stages or two complete revolution to complete one power stroke, while a two-stroke engine goes through two stages or one complete revolution to complete one power stroke,
- A two-stroke produces higher torque than four stroke
- Two-stroke engine combines more function in one piston movement i.e. during the upwards movement of the piston (compressing the air/fuel/oil mixture) in the combustion chamber, underneath the piston a fresh mixture of air/fuel/oil is drawn in the hermetically closed.
- Two stroke engine weigh less than four stroke
- Two stroke engine lacks valve system
- During operation, the two stroke engine crates less friction on parts and thus has high efficiency
- Two stroke engine consumes more fuel
- Two stroke engine cause more vibration and noise
- Two stroke engine produces less power
- Two stroke engine has a shorter life span

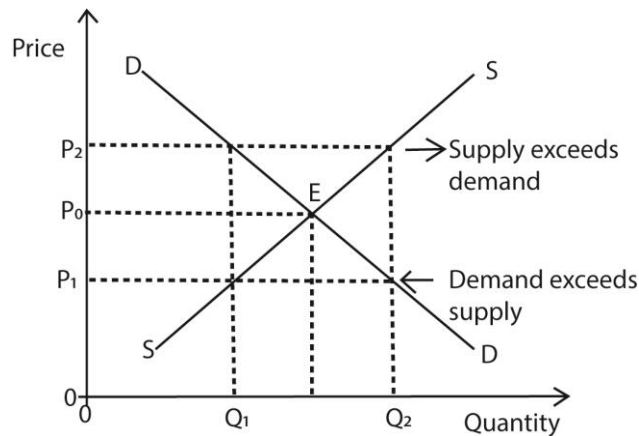
SECTION D (20MARKS)

AGRICULTURAL ECONOMICS

Answer **one** question from this section

8. (a) Using an illustration, explain how market price is determined in a competitive market. (07marks)

In this market, prices are determined by forces of demand and supply.



- At high price OP_2 supply exceeds demand and therefore a surplus Q_0Q_2 is created. When supply is in excess, the producer decreases the price in order to sell the surplus (excess) and in the process equilibrium is restored in the market at point E.
- At lower price OP_1 , quantity demanded exceeds quantity supplied therefore a shortage Q_1Q_0 is created which forces the producer (seller) to increase the price until the equilibrium is restored at E.

Note

- **Market price** refers to the prevailing (ruling) price in the market at a given time. Market price is any price determined by the buyers and sellers in the market irrespective of whether quantity demanded is equal to quantity supplied at a given.
- **Equilibrium price** refers to the market price where quantity demanded is equal to quantity supplied.
- **Normal (natural) price** refers to the long run equilibrium price established in the market after a long period of price fluctuations.
- **Reserve price** refers to the minimum price set by the seller below which he is not willing to sell his commodity.

(b) Describe the effect of fluctuation in the prices of agricultural products. (09marks)

- Farmers get discouraged
- Leads to fluctuation of government revenue from agricultural related products
- Leads to unemployment because people abandon agriculture
- Leads to unstable export earnings
- Unstable terms of trade since the cost of imports remain constant
- Make planning agriculture difficult leaving it to mere speculation
- Encourages rural-urban migration search of job with stable income
- Reduced production because price fluctuation discourage investment in agriculture
- Income inequality rises because some become rich others poor due to agricultural price fluctuations.
- Make it hard to pay back agricultural loans

- Make it hard for banks to avail agro based loans

(c) What measures can government adopt to stabilize prices of agricultural products? (04marks)

- **Buffer stocks.** The government should buy up part of the supply when output is in excess, store this surplus and later sells it to the consumer in times of reduced supply.
- **Stabilization fund.** The government through marketing boards can maintain or increase prices of agricultural products, depending on world market prices. If profits are made, they are saved and used to stabilize prices and incomes of the farmers.
- A variety of agricultural activities should be introduced e.g. crop farming, poultry, animal husbandry etc. to reduce over dependence on one or a few sources of agricultural income in a bid to stabilize farmers' income.
- **Encourage formation of cooperatives** to bargain fair prices
- **Introduce irrigation schemes** to ensure continuous supply of agricultural products.
- **Stability in prices of agriculture** can also be attained by improving transport system to enable easy marketing
- There is a need to improve, **develop and expand storage facilities** to accommodate excess output in agriculture.
- **Price control.** Government should establish the minimum and maximum prices for agricultural output.
- **Market expansion.** Government should expand agricultural output market through economic integrations
- encourage further diversification of agriculture

9. (a) Distinguish between:

(i) Variable costs and fixed costs (06 marks)

Fixed costs are expenses that a farmer has to meet whether in production or not. They include interest on loans, rent, depreciation, salaries for permanent workers.

Variable costs are expenses that depend on the level of output or vary with output e.g. costs for inputs (pesticides, seeds), wages for casual workers increase in output increases the variable costs.

(ii) Opening valuation and closing valuation. (04marks)

Opening stock represents the value of inventory at the beginning of an accounting period, while closing stock represents the value of inventory at the end of the accounting period.

(b) The following is a list of Mr. Kato's financial transactions in the year, 2000.

	Shs
Coffee sale	70,000
Sale of sheep	3,000
Closing valuation	150,000
Purchase of fertilizer	60,000
Veterinary bills	3,000
Milk sale	30,000
Wages	24,000
Opening valuation	121,000
Interest payable	6,500
Depreciation of machinery	7,000
Purchase of hoes	700
Construction of crush	2,500

Prepare a trading account for Mr. Kato as on 31/12/2000 from the information provided (10marks)

A trading account for Mr. Kato as on 31/12/2000

Purchase and expenses		Sales and receipts	
Items	Ug. Shs.	Items	Ug. Shs.
Opening valuation	121,000	Closing valuation	150,000
Purchase of fertilizer	60,000	Coffee sale	70,000
Veterinary bill	3,000	Sale of sheep	3,000
Wages	24,000	Milk sale	30,000
Interest payable	6,500		
Depreciation of machinery	7,000		
Purchase of hoe	700		
Construction of crush	2,500		
Subtotal	224,700		253,000
Profit	28,300		
Total	253,000	Total	253,000

END

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Thanks

Dr. Bbosa Science