KISII UNIVERSITY
UNIVERSITY EXAMINATIONS

THIRD YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE IN AGRICULTURE EDUCATION & EXTENSION

FIRST SEMESTER 2022/2023

(SEPTEMBER - DECEMBER, 2022)

AGEN 331: INTRODUCTION TO AGRICULTURAL FIELD MACHINES

STREAM: Y3 S2 **TIME: 2 HOURS**

DAY: THURSDAY, 9:00 A.M – 11:00 A.M **DATE: 08/12/2022**

INSTRUCTIONS:
1. Do not write anything on this question paper.
2. Answer ALL Questions in section A (Compulsory) and any other TWO questions in section B.

SECTION A

QUESTION ONE

a) Explain the meaning of mechanization. (2 marks)

b) Outline the effect of tillage on physical properties of soil. (2 marks)

c) Based on their relationship with the source of power, motorized implements can be grouped into many types. Describe four of those types and for each type, name one example of implement. (2 Marks)

d) Define the following terms:

i) Primary tillage;

ii) Secondary tillage;

iii) Conventional tillage;

iv) Minimum tillage. (2 Marks)

e) Explain how farm size affect mechanization. (2 Marks)

f) Mention four major objectives of tillage and explain briefly how tillage by a mould board plough can achieve each of those objectives.

(2 Marks)

g) Explain how complementary technologies affect mechanization. (2 marks)

h) Give the various means by which the high penetration of disc harrows can be achieved. (2 Marks)

i) State four merits of using planter machines in carrying out planting activities in a farm. (2 Marks)

j) Explain the suitability of high volume spraying. (2 Marks)

k) Explain the importance of maintaining agricultural machinery. (2 Marks)

l) Outline the importance of adjusting a disc plough before going to the field. (2 Marks)

m) Describe four principle adjustments of a combine harvester. (2Marks)

n) Define land levelling and state its importance. (2 Marks)

o) Explain the importance of specialized tyres in earth moving equipment. (2 Marks)

SECTION B

QUESTION TWO

a) i) Four oxen of approximately 550kg live mass each are harnessed to a farm machine by use of an evener. With the help of a diagram, show how the team of four (4) animals may be connected to the implement. (4 Marks)

ii) Calculate the expected power output if:
The pull/weight ratio for the oxen is about 0.12;
The multiplication factors for such animals working in a team are1.9, 2.5, 3.1, 3.5, and 3.8 for 2,3,4,5 and 6 animals respectively. (4 Marks)
Working speed of 3 KM/Hour.

b) Discuss briefly four advantages of mechanization of farm activities. (4 Marks)

c) Define disc concavity and state its effects. (4 Marks)

d) Explain with relevant sketches the difference between a tandem and offset disc harrows. (4 Marks)

QUESTION THREE

a) Outline the operational differences between a disc plough and mould board plough. (5Marks)

b) The total draft of a four bottom 35 cm mould board plough when ploughing 18 cm deep at a speed of 5 km/hr. is 1600kg. Calculate:

i) Unit draft in kg/cm2; (2Marks)

ii) Power requirement in HP; (1 Mark)

iii) If the field efficiency is 75% what is the rate of doing work. (2 Marks)

c) Briefly explain implement hitching mechanism giving examples of each type. (5 Marks)

d) Highlight the regular maintenance curried out on mould board plough. (5 Marks)

QUESTION FOUR

a) Assume you work for a company dealing with farm machinery for hire. A farmer asks you to estimate for him the cost of tilling his 10 hectare field. Using the following information:

The implement to be used is a two-bottom mould board plough of rated width 75cm and mounted on a wheel-type tractor working at an average speed of 6km/h with an effective field efficiency of about 80%.

The new cost of the mould board was Ksh.20, 000 and it is expected to stay in use for 15 years. It is used for about 100 hours in a year. Its cost of repair and maintenance per hour is estimated at 0.08% of the new cost.

The new cost of the tractor was Ksh.1, 500,000 and it is expected to stay in use for 20 years. On average, it is used for about 500 hours in a year. Its cost of repair and maintenance per hour is estimated at 0.01% of the new cost. The tractor uses an average of 4 litres of diesel per hour costing Ksh.95 per litre and its driver is paid Ksh. 200 per hour.
The interest rate charged by local banks is 20% p.a.
The company has a policy of charging a 10% profit for each hire operation.

Estimate:
i) The time required for the tilling operation to nearest ½ hour. (4 Marks)
ii) The cost of the operation. (10 Marks)

b) Describe the following planting:

i) Seed drill;

ii) Planter;

iii) Transplanter. (6 Marks)

QUESTION FIVE

a) Discuss the following seed metering mechanisms:

i) Cup feed type;

ii) Auger feed;

iii) Flute feed type. (6 Marks)

b) A fluted feed seed drill has 8 furrow openers spaced 30 cm apart. The min drive wheel has a diameter of 110cm. How many turns will the drive wheel make to cover anarea of 1 hectare. (4 Marks)

c) State five activities required for maintenance and good care of farm implements and explain the importance of each activity. (10 Marks)