



**FACULTY OF NATURAL RESOURCES MANAGEMENT AND
AGRICULTURE**

DEPARTMENT OF HORTICULTURE AND CROP PRODUCTION

PROGRAMME: BSc HONOURS CROP SCIENCE/ANIMAL SCIENCE

LCS2207: FARM MACHINERY AND STRUCTURES

FINAL EXAMINATION

APRIL 2024

This examination paper consists of 3 pages.

Time Allowed:	3 Hours
Total Marks:	100
Special Requirements:	Scientific calculator (supplied by student)
Examiner's Name:	Eng. Madzaramba T.H

Instructions

1. Answer **ALL** questions in Section A
2. Answer any **THREE (3)** questions in Section B

Mark allocation

Question	Marks
Section A	40
Section B	60
Total attainable marks	100

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SECTION A: Answer ALL questions.

Question 1

- a) Compute the nozzle flow rate for a tractor-mounted boom sprayer with nozzles spaced at 95 cm if the average forward speed is 1.8m/s. The farmer intends to obtain an application rate of 215 l/ha. [8]
- b) Outline the main maintenance requirements of a rotary milking parlour. [10]
- c) A farmer bought a small grain seeder from a local farm machinery dealer with 15 furrow openers with a spacing of 20cm. The machine operator is supposed to calibrate the machine before using it to achieve the desired plant population for millet. Machine specifications indicate a radius of 60cm for the drive wheel. Calculate the seed rate per hectare if the seed collected is 7.5kg from 50 revolutions of the drive wheel. Assume 10% positive slippage in the drive wheel during operation. [10]
- d) Name and describe any four (4) components of a herringbone milking machine. [12]

Total [40]

SECTION B: Answer any THREE questions.

Question 2

Precision planters are widely used for sowing various seeds in commercial farms and in large estates. Describe in detail four (4) seed metering mechanisms used in precision planters. [20]

Question 3

- a) Outline objectives of secondary tillage in pasture production [10]
- b) The agronomist intends to check whether the settings on the mechanical planter were correct. The following information was obtained from a trial run operation:
Sugar bean sowing rate: 350kg/ha
Effective width of seed drill: 4.6m
Drive wheel diameter: 1200mm
Run distance: 0.2km
Run time: 40 seconds.
Determine:
- i. The quantity of sugar beans sown on the test run [4]
- ii. The number of wheel revolutions required to give the expected quantity during a static test trial [6]

Question 4

- a) Highlight design features that should be considered by a farmer in Matabeleland South before purchasing farm equipment. [10]
- b) If the amount of fertilizer to be applied per hectare is 380kg, the swath is assumed to be 9.65 meters and the forward speed of the implement is 2.15 m/s, how much fertilizer must be delivered per minute? [5]
- c) State the meaning of this code F/80/1.2/3 [5]

Question 5

- a) A machinery manager is preparing an equipment schedule for tillage purposes at the farm. It is expected that the equipment works 12 hours each day for 18 days. At the beginning of the season, the farmer intends to plough 250ha of prime land using a reversible disc plough with an effective operating width of 375cm. The ploughing operation takes 75% of the equipment's working time using an average forward speed of 2m/s.

Calculate:

- i. TOT [3]
 - ii. TFC [4]
 - iii. EFC [4]
 - iv. FE [3]
- b) Explain the working mechanism of a cutter-bar mower [6]

Question 6

Briefly explain how the following fixed costs affect the profitability of farm machinery and structures:

- i. Depreciation [5]
- ii. Interest charges [5]
- iii. Housing [5]
- iv. Insurance and taxes [5]

END OF QUESTION PAPER!!!