

GWANDA STATE UNIVERSITY



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

SUPPLEMENTARY 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) Define the following terms:

- i. Pulsation cycle [2]
- ii. Conservation tillage [2]
- iii. Theoretical field capacity [2]
- iv. Actual field capacity [2]
- v. Power performance [2]

b) Outline the calibration of a manual maize planter using the static method. [10]

c) A soyabean planter with 12 furrow openers at 25cm spacing is to be calibrated to achieve desired seed rate for sowing soyabeans. The radius for drive wheels is 60cm. Determine the seeding rate per hectare if the seed collected after 150 revolutions of the drive wheel is 10kg. There is no positive slippage. [10]

d) Determine the draft and drawbar power of a 2.5m- tandem disk harrow when disking on clay soil at a speed of 4km/hr and a depth of 15 cm [10]

**Total [40]**

**SECTION B: Answer any THREE questions.**

**Question 2**

- a) Calculate the nozzle flow rate for a sprayer with nozzles spaced at 101.6 cm if the travel speed is 6.4 km/hr and the desired application rate 235 l/ha. [8]
- b) Outline any four (4) factors that affect power performance of agricultural machinery. [12]

**Question 3**

- a) The global population surpassed 8 billion in November 2022. It is evident that the population growth and with it the demand for food will continue to increase. Describe the role of emerging technologies in food production post November 2022. [10]
- b) Outline five (5) functions of a pneumatic planter [10]

#### Question 4

- a) A farmer intends to plough 50 ha of land in 15 days, working 10 hours per day. The estimated field efficiency is 75% and the tractor working speed is 6km/hr. Calculate:
- i. Total working time in hours [2]
  - ii. Actual field capacity [3]
  - iii. Theoretical field capacity [3]
  - iv. Average effective width of plough to be used. [3]
  - v. Drawbar power if soil draft is 375N/m/cm, plough depth is 10cm. [4]
- b) Explain five (5) advantages of a disc plough in soil manipulation [5]

#### Question 5

- a) Outline the operation of a rotary milking machine. [8]
- b) Name and describe four (4) components of a herringbone milking machine [12]

#### Question 6

- a) If the amount of fertilizer to be applied per hectare is 450kg, the swath is assumed to be 10 meters and the tractor will travel at 1.75 m/s, how much fertilizer must be delivered per minute? [5]
- b) Decode this nozzle code **F/80/1.2/3** [5]
- c) Describe the service requirements of a combine harvester at various stages of its life span [10]

**END OF QUESTION PAPER!!!**