



*"Investing in Africa's Future"*

**COLLEGE OF HEALTH, AGRICULTURE & NATURAL  
SCIENCES**

**NAAE 211: FARM POWER AND MACHINERY  
END OF SECOND SEMESTER EXAMINATIONS**

**April/May 2024**

**LECTURER: MR. W. ZENDERA**

**DURATION: (3HRS)**

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***INSTRUCTIONS***

1. Answer ALL question in Section A                      20 Marks
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2. Answer four questions in Section B                      80 Marks
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Use the answer booklet provided

Begin the Answer for each question on a new page

### Question 1 A

Africa University farm owns a CASE 180 Hp tractor with the following specifications.

Tractor size	180 Hp (4WD)
List price	\$200 000
Purchase price	\$180 000
Expected useful life	20 years
Current age	6 years
Annual usage	400 hours
Fuel price	\$1.50
Labour costs	\$1.20/hr
Interest rate	10 %

Compute the following cost incurred when owning and using the tractor:

- a) Ownership costs per year
  - i. Depreciation, [3 marks]
  - ii. Interest, [3 marks]
  - iii. Tax, Insurance and Housing. [2 marks]
- b) Variable costs per year
  - i. Repair and maintenance, [3 marks]
  - ii. Fuel costs, [3 marks]
  - iii. Lubrication costs, [2 marks]
  - iv. Labour costs. [2 marks]
- c) Calculate the total cost per hour of running the tractor. [2 marks]

## Section B

### (Answer Four Questions, 80 Marks)

#### Question 1B

- a) Explain the purpose of the following tractor accessories:
- i. Enclosed cabin. [2 marks]
  - ii. Independent brakes, [3 marks]
  - iii. Differential lock, [2 marks]
  - iv. External hydraulics, [2 marks]
  - v. Ballasts. [2 marks]
- b) Describe the function of the following PTO drive
- i. Transmission type PTO, [3 marks]
  - ii. Live PTO (two stage clutch), [3 marks]
  - iii. Independent running PTO. [3 marks]

#### Question 2B

- a) State the part of the seed drill that performs the following functions:
- i. Holding the seed, [2 marks]
  - ii. Opening the furrow onto which the seed is placed, [2 marks]
  - iii. Metering the seed at the required interval, [2 marks]
  - iv. Placing the seed into the furrow, [2 marks]
  - v. Lightly compacting around the seed. [2 marks]
- b) Outline a step by step static method of calibrating a plant. [10 marks]

#### Question 3B

- a) Describe the effect of the following adjustments on a disc plough:
- i. Spacing between discs, [3 marks]
  - ii. Breast cut angle, [4 marks]
  - iii. Tilt angle. [3 marks]
- b) Explain the function of the following components:
- i. Share, [2 marks]
  - ii. Land side, [2 marks]
  - iii. Skim coulter, [2 marks]
  - iv. Subsoiler, and [2 marks]
  - v. Scrapper. [2 marks]

#### Question 4B

- a) List the objectives of secondary tillage operations. [4 marks]
- b) Explain the six basic operations performed by a combine harvester. [12 marks]
- c) Explain the grain losses that may occur due to use of combine harvesters. [4 marks]

#### Question 5B

- a) Describe the function of each of the following components of an ignition system:
  - i. Battery [2 marks]
  - ii. Spark plug [2 marks]
  - iii. Distributer [2 marks]
  - iv. Contact breaker point [2 marks]
  - v. Coil [2 marks]
- b) Explain the possible causes of the following types of smoke in diesel engines:
  - i. White smoke. [3 marks]
  - ii. Black smoke. [3 marks]
  - iii. Blue smoke. [2 marks]

#### Question 6B

- a) Describe the working principle of a power steering. [6 marks]
- b) State the advantages of a power steering over a mechanical steering system. [4 marks]
- c) Describe the effect of the following in steering geometry:
  - i. Caster angle, and [5 marks]
  - ii. Camber. [5 marks]