



*"Investing in Africa's Future"*

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

**NAAE 201: FARM POWER AND MACHINERY**

**END OF SECOND SEMESTER EXAMINATIONS**

**April/May 2023**

**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

## Section A

**(Answer All Questions, 20 Marks)**

### Question 1

Use table 1 below to estimate the cost of operating a self-propelled combine. Assume the current price of diesel to be \$1.50 per litre and operator to be paid at a rate of \$1 per hour

<b>Basic information</b>		Rate/hr
100 Hp 1.5 m self-driven maize Combine		
Cost price	\$80 000	
Expected economic life	10 years	
Current years of usage	5	
Annual usage	300 hrs	
Opportunity cost of combine	12%	
Average value	.....	
<b>Estimate fixed costs</b>		
Depreciation (straight line method)	[2 marks]	
Interest	[2 marks]	
TIH	[2 marks]	
Total annual fixed costs	[2 marks]	
Fixed costs/hr		[1 marks]
<b>Estimate variable costs</b>		
Repair and maintenance costs	[2 marks]	
Fuel	[2 marks]	
Labour	[2 marks]	
Total annual variable costs	[2 marks]	
Annual costs/hr		[1 marks]
<b>Total costs of running the combine/hr</b>		[2 marks]

## Section B

### (Answer Four Questions, 80 Marks)

#### Question 1B

Explain some of the care points that can help tractors tyres to perform productively and ensure a long life.

[20 marks]

#### Question 2B

a) Briefly describe the purpose of each of the following tractor accessories:

- i. Tractor cabin, [2 marks]
- ii. Three point linkage system, [2 marks]
- iii. Differential lock, [2 marks]
- iv. External hydraulics, and [2 marks]
- v. Independent brakes. [2 marks]

b) Explain the function of the following types of mechanical PTO drives on tractors:

- i. Transmission type PTO drives, [4 marks]
- ii. Live PTO drive/two stage clutch, [3 marks]
- iii. Independent drive PTO. [3 marks]

#### Question 3B

a) Name the part of the seed drill that performs the following functions:

- i. Holding the seed, [2 marks]
- ii. Opening the furrow into which seeds are placed, [2 marks]
- iii. Metering the seeds at the required interval, [2 marks]
- iv. Placing the seeds into the furrow, [2 marks]
- v. Lightly compacting around the seed. [2 marks]

- b) Identify the following components of a combine harvester in Figure 1 labeled 1-10. [10 marks]

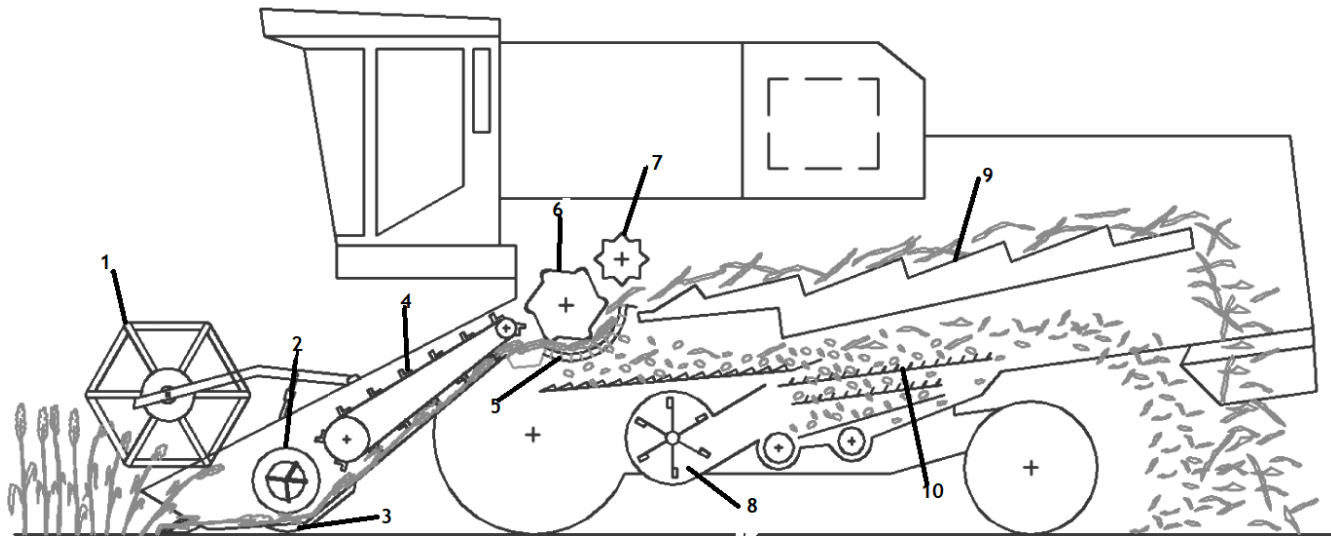


Figure 1

Question 4B

- State two types of liquid (water) cooled systems found in combustion engines. [2 marks]
- Explain the four main functions of the cooling system of a combustion engine. [8 marks]
- Explain the function of the radiator. [5 marks]
- How does a thermostat regulate the flow of the coolant in a combustion engine. [5 marks]

Question 5B

- When to trade or replace a machine is one of the most difficult decisions in machinery management. Discuss some of the reasons that can make one decide to replace farm machinery. [10 marks]
- Suppose the Farm Manager plants 150 ha of potatoes per year with an average yield of 3000 kg/ha. Currently he uses seasonal labourers to dig potatoes at a cost of \$1.50 per 10kg pocket. The Manager is now considering the purchase of a mechanical potato digger to replace seasonal labourers. A new potato digger costs \$6000 and after a useful life of 5 years he can sell it for \$2000. The variable costs are \$3/ha, and costs incurred due to yield and quality losses amount to \$24/ha.

- i. Is the replacement of labour by a potato digger justifiable at the present scale of production? [5 marks]
- ii. What is the minimum scale of production that will make the replacement economically justifiable? [5 marks]

Question 6B

- a) State six functions of the lubrication system. [6 marks]
- b) Describe the procedure for changing the engine oil and oil filter. [10 marks]
- c) Explain the maintenance frequency of the lubrication system. [4 marks]

End of Examination Paper