"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)

INSTRUCTIONS

1. **Answer ALL question in Section A**   20 Marks

2. **Answer four questions in Section B**   80 Marks

Use the answer booklet provided

Begin the Answer for each question on a new page

Section A

(Answer All Questions, 20 Marks)

Question 1 A

a) Estimate the following costs involved in owning and operating maize combine by completing the table below:

General data		
New 100 Hp 3 row-1.5m self-driven combine		
Cost price	$15 000.00	
List Price	$13 000.00	
Economic life	10 years	
Current age	4 years	
Interest rate	12% pa	
Annual usage	300 hours	
Salvage Value	xxxxx [1 mark]	
Average value	xxxxx[1 mark]	
Fixed Costs		
Depreciation	xxxx[2 marks]	
Interest	Xxxx[1 mark]	
Tax Insurance and Housing	Xxxxx[2 marks]	
Total annual Fixed costs	Xxxxxx[2 marks]	
Fixed costs per hours		Xxxx
Variable costs		
Repair and Maintenance costs	Xxxx [2 marks]	
Fuel costs	Xxxxx[2 marks]	
Lubrication cost	Xxxxxx[2 marks]	
Labour costs @$0.60/hr	Xxxxx[1 marks]	
Total Variable costs/year	Xxxxxx[2 marks]	
Variable costs per hour		Xxxxx
Total costs of running the combine/per hour		Xxxxxx[2 marks]

Question 1B

a) Define machine reliability. [3 marks]
b) With the aid of a diagram (bathtub curve) describe the general
   machine failure pattern. [8 marks]
c) Explain the following types of machinery maintenance strategies:
   i. Break down maintenance, [3 marks]
   ii. Condition monitoring, [3 marks]
   iii. Periodic maintenance. [3 marks]

Question 2B

a) Describe the effect of the following adjustments on a disc plough.
   • Spacing between discs [3 marks]
   • Horizontal angle [3 marks]
   • Tilt angle [3 marks]
b) Describe the mode of function of the two most common types
   of agitators in sprayers. [4 marks]
c) A 300XG boom sprayer has a tank capacity of 1135 litres with a 13.7 m boom
   with single nozzles spaced at 50.8 cm. The boom has been calibrated to apply
   140 l/ha. It is recommended that the pesticide be applied at 2.8 litres/ha. If
   the tractor is moving at a speed of 6.8 km/hr calculate:
   i.   The number of nozzles on the boom, [2 marks]
   ii. Nozzle discharge (l/min), [3 marks]
   iii. Calculate the amount of pesticide to be added to the tank. [2 marks]

Question 3B

a) Describe five advantages of using a disc plough over
   a mouldboard plough. [10 marks]
b) With the aid of diagrams describe the following gang assemblies:
   i. Single acting disc harrow, [5 marks]
   ii. Tandem disc harrow. [5 marks]

Question 4B

Explain the possible causes of the following tractor problems:

    a) Overheating in the tractor engine,   [5 marks]
    b) Lack of engine power,   [5 marks]
    c) Battery is failing to charge,   [5 marks]
    d) Tractor is difficult to start or could not start.   [5 marks]

Question 5B

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

Question 6B

    a) State two types of liquid (water) cooled systems.   [2 marks]
    b) Explain the four main functions of the cooling system of a
       combustions system.   [8 marks]
    c) Explain the function of a radiator.   [5 marks]
    d) Explain how the thermostat regulates the flow of a coolant in a
       combustion engine.   [5 marks]