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SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

AGRICULTURAL TECHNOLOGY

MAY/JUNE 2024

MARKS: 200

TIME: 3 hours

This question paper consists of 19 pages.



INSTRUCTIONS AND INFORMATION

1. GENERAL INSTRUCTIONS AND INFORMATION
 - 1.1 This question paper consists of TWO sections, namely SECTION A and SECTION B.
 - 1.2 BOTH sections are COMPULSORY.
 - 1.3 Answer ALL the questions in the ANSWER BOOK.
 - 1.4 Number the answers correctly according to the numbering system used in this question paper.
 - 1.5 You may use a non-programmable calculator.
 - 1.6 Show ALL calculations.
 - 1.7 Write neatly and legibly.
2. SECTION A: SHORT QUESTIONS
 - 2.1 This section consists of THREE questions.
 - 2.2 Follow the instructions when answering the questions.
3. SECTION B: STRUCTURED LONG QUESTIONS
 - 3.1 This section consists of FIVE questions.
 - 3.2 Start EACH question on a NEW page.

SECTION A**QUESTION 1**

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.

1.1.1 The amperage of an electric fence may never be higher than ... amperes.

- A 0,2
- B 20
- C 0,005
- D 0,002

1.1.2 When working with fibreglass, the hardening agent is called the ...

- A catalyst.
- B resin.
- C glue.
- D epoxy.

1.1.3 Identify ONE of the following qualities that best suits the transmission oil used in a tractor's hydraulic system:

- A Volatile
- B Compressible
- C Expensive
- D Remains liquid over a large temperature range

1.1.4 The teeth of this type of gear are angled in both directions and cannot be meshed from the side:

- A Spur gear
- B Helical gear
- C Double helical gear
- D Idler gear

1.1.5 Name ONE disadvantage of V-belts:

- A Easily slips off pulleys
- B Easily joined
- C Much more dangerous than flat belts
- D Subject to stretching

- 1.1.6 A ... indicates the gas pressure in the cylinders of an oxyacetylene set.
- A release valve
 - B calibrated glass tube with a metal ball inside
 - C content gauge
 - D flash-back indicator
- 1.1.7 ... is NOT one of the functions of the GPS in a modern combine harvester.
- A Yield monitoring
 - B Autonomous steering
 - C Detection of mechanical problems
 - D Determining the position of the combine harvester
- 1.1.8 A photovoltaic panel utilises the ... in the rays of the sun to generate electrical energy.
- A photons
 - B X-rays
 - C ultraviolet rays
 - D heat
- 1.1.9 An example of fixed expenses on a tractor:
- A Fuel
 - B Labour
 - C Depreciation
 - D Repair
- 1.1.10 A solar geyser system concentrates the heat from the sun on the ... to heat up water.
- A glass tubes
 - B lithium cells
 - C plasma filament
 - D photon surface
- (10 x 2) (20) 200

1.2 Change the underlined word(s) in the following to make the statements TRUE. Write only the appropriate word(s) next to the question numbers (1.2.1 to 1.2.5) in the ANSWER BOOK, e.g. 1.2.6 Tractor.

1.2.1 Bronze is a metal alloy made from copper and cast iron.

1.2.2 The tyres of a tractor can be inflated with helium to positively change the mass displacement of a tractor.

1.2.3 During overhead gas welding, the force of the arc helps to keep the molten metal in position.

1.2.4 The melting point of Vesconite is 327 °C and it is used as a coating in cooking pans.

1.2.5 Chromium is used as an alloy element in stainless steel and it helps to give steel a fair amount of toughness at low temperatures.

(5 x 2) (10)

1.3 Choose a word/term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–I) next to the question numbers (1.3.1 to 1.3.5) in the ANSWER BOOK, e.g. 1.3.6 J.

COLUMN A		COLUMN B	
1.3.1	Capital used to pay contractors for work and repairs done on a farm	A	moveable capital
		B	thermal imaging
1.3.2	Type of capital used to improve kraals on a farm and to sink boreholes	C	micro irrigation
		D	fixed capital
1.3.3	Used to determine areas of undergrowth in a maize field	E	differential lock
		F	running expenses
1.3.4	Is used to lock both wheels on an axle together as on a common axle	G	working capital
		H	universal joint
1.3.5	Water is delivered directly to the roots of plants	I	overhead irrigation

(5 x 2) (10)

TOTAL SECTION A: 40

SECTION B**QUESTION 2: MATERIALS AND STRUCTURES**

Start this question on a NEW page.

- 2.1 The picture below shows a stainless-steel milk tank used for storing fresh milk in the milking parlour.



- 2.1.1 Explain why chromium is a suitable alloy for the manufacturing of milk tanks. (3)
- 2.1.2 Which alloy element, other than chromium, can be added to stainless steel to ensure resistance to air, water and many acids and alkali? (1)
- 2.2 A water pipe system must be installed in a milking parlour to ensure clean running water.
- 2.2.1 Give a reason why copper is not a suitable material for the manufacturing of pipe fittings. (1)
- 2.2.2 Name the alloy element that is used with copper to form durable brass pipe fittings. (1)
- 2.2.3 Name THREE properties of brass. (3)
- 2.3 List THREE common uses of tin. (3)

2.4 The picture below shows a part that needs to be repaired with an adhesive.



- 2.4.1 Name TWO important aspects that should be considered when choosing a specific adhesive for a repairing task. (2)
- 2.4.2 Discuss heat resistance as a property of an adhesive. (2)
- 2.4.3 Explain the difference between the *duration of usability* and the *duration of cohesion* of adhesives. (2)

2.5 The picture below shows a fibreglass canoe.



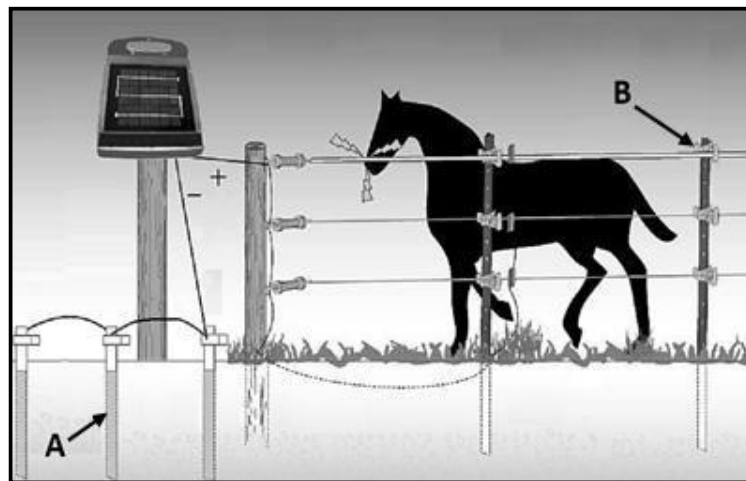
- 2.5.1 Name FOUR characteristics of fibreglass that makes it a suitable material for the manufacturing of small boats. (4)
- 2.5.2 State FOUR precautionary measures that must be taken by the person working with fibreglass. (4)

- 2.6 The table below shows a few types of material used on farms. Write only the answer next to the question numbers (2.6.1 to 2.6.3) in the ANSWER BOOK.

MATERIAL	DESCRIPTION	USES
2.6.1 ... (1)	Specialised thermoplastic made from internally lubricated polymers	Bushes Washers Wear plates Shackle pins
Teflon	A plastic with the lowest coefficient of friction	2.6.2 ... (TWO uses) (2)
Bronze	2.6.3 ... (2)	Tools Weapons Bells

(5)

- 2.7 The illustration below shows an electric fence that is used on a farm to manage grazing.



- 2.7.1 Name part **A**. (1)
- 2.7.2 Identify the device shown in the illustration that produces the electricity for the electric fence. (1)
- 2.7.3 State the function of part **B**. (1)
- 2.7.4 Name the material from which part **B** is manufactured. (1)

[35]

QUESTION 3: ENERGY**Start this question on a NEW page.**

- 3.1 Alternative energy systems like the one shown below play a major role in supplying electricity on farms.



- 3.1.1 Name TWO instances where a small wind turbine can be useful on a farm. (2)
- 3.1.2 State TWO disadvantages of wind turbines. (2)
- 3.1.3 Describe the importance of a larger blade area of a wind turbine in relation to the generation of electrical energy. (2)
- 3.1.4 Name the device installed in the head of the wind turbine to decrease torque and increase input shaft speed to the generator. (1)
- 3.2 The picture below shows an alternative energy system.



- 3.2.1 Identify the type of alternative energy system in the picture above. (1)
- 3.2.2 Name a suitable material for the coating on the panels and state ONE property of this coating. (2)
- 3.2.3 Batteries can be recharged using the system above. What can be installed in the system to prevent overcharging of the batteries? (1)

- 3.3 Study the table below and rearrange the working principles of a geothermal power station in the correct sequence, e.g. 9, 7, 10, 8, 6.

STEPS	GENERATION SEQUENCE
1	A condenser cools the steam and water is formed
2	Underground heat source heats up the water
3	Generated electrical energy is sent to the national grid
4	Cold water is pumped into the bore hole
5	Steam is transferred to a turbine and generator unit

(5)

- 3.4 Describe the term *biofuel* and give ONE example of such a fuel.

(4)

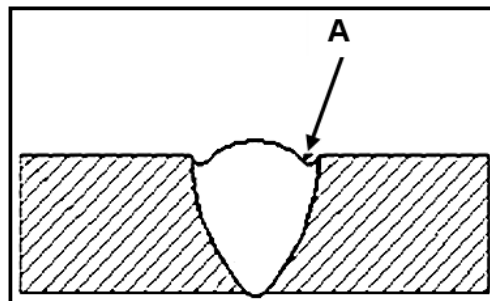
[20]

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES**Start this question on a NEW page.**

4.1 The image below shows a part of the MIG welding apparatus.



- 4.1.1 Identify the part of the MIG welding apparatus that is used by the welding operator to activate the electrical charge to the workpiece that melts the filler wire. (1)
- 4.1.2 Describe the *MIG welding process*. (5)
- 4.1.3 State the composition of the MIG welding shielding gas. (3)
- 4.1.4 Name FOUR problems that will prevent the welding wire from feeding through the torch gun when welding. (4)
- 4.1.5 Identify the welding defect indicated by **A** in the illustration below and state TWO possible causes. (3)



- 4.2 Describe the procedure that must be followed when preparing galvanised metal for the welding process. (2)

- 4.3 Draw a labelled sketch of a horizontal square butt weld. Indicate the angle of the welding electrode and the direction of travel.

Marks will be allocated for the following:

Design	1
Angle of electrode	1
Direction of travel	1
Neatness	1
Labelling	1

(5)

- 4.4 The welding plane continuously changes as the welder welds a joint on a pipe. State THREE pipe welding positions. (3)

- 4.5 The image below shows a type of oxyacetylene cutting apparatus.



- 4.5.1 Which metals should NOT be cut with the above apparatus? Motivate the answer. (2)

- 4.5.2 What happens when the torch is moved too fast when cutting a thick metal plate? (3)

- 4.6 The picture below shows a plasma-cutting nozzle.



- 4.6.1 Name the material that is used for manufacturing the plasma cutter combustion cap. (1)

- 4.6.2 State THREE properties of the material named in QUESTION 4.6.1. (3)

[35]

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT**Start this question on a NEW page.**

- 5.1 The pictures below show TWO types of lawnmowers. Answer the questions that follow.

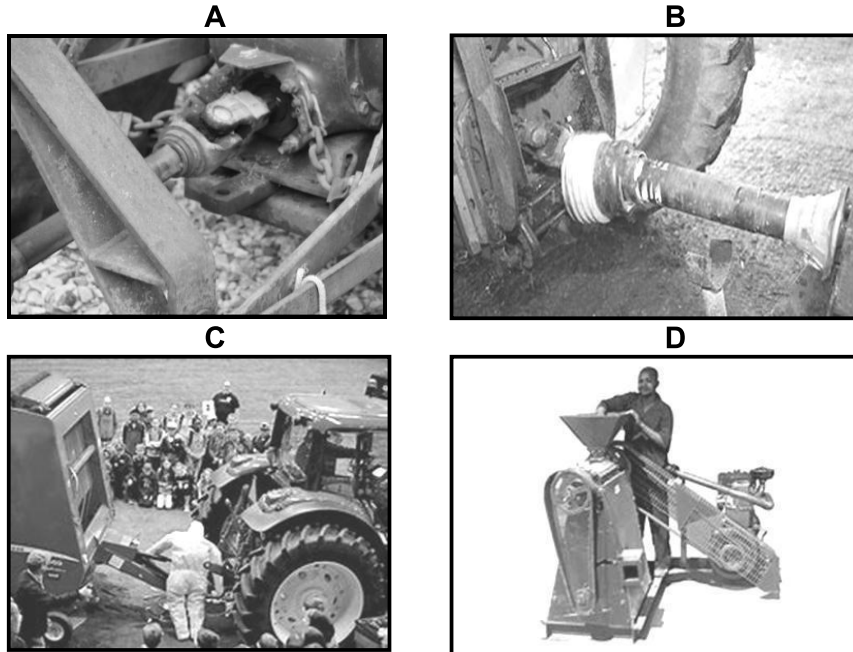
A**B**

- 5.1.1 Identify the power sources of mower **A** and mower **B**. (2)
- 5.1.2 State TWO maintenance tasks to be performed on mower **B**. (2)
- 5.1.3 State TWO safety tips when working with lawn mowers. (2)



5.2 A hammer mill is used to pulverise different types of animal feed.

5.2.1 Identify the safety hazards depicted in EACH picture below.



(4)

5.2.2 When setting up a hammer mill, it needs to be on a level surface.






Do you agree with this statement? Motivate the answer.

(3)

5.2.3 A PTO drive shaft can reach a rotational speed of up to 2 800 r/min (revolutions per minute). Determine how many revolutions will occur per second.

(3)

- 5.3 Match EACH device in the table below with a use. Write only the letter (A–E) next to the question numbers (5.3.1 to 5.3.5) in the ANSWER BOOK.

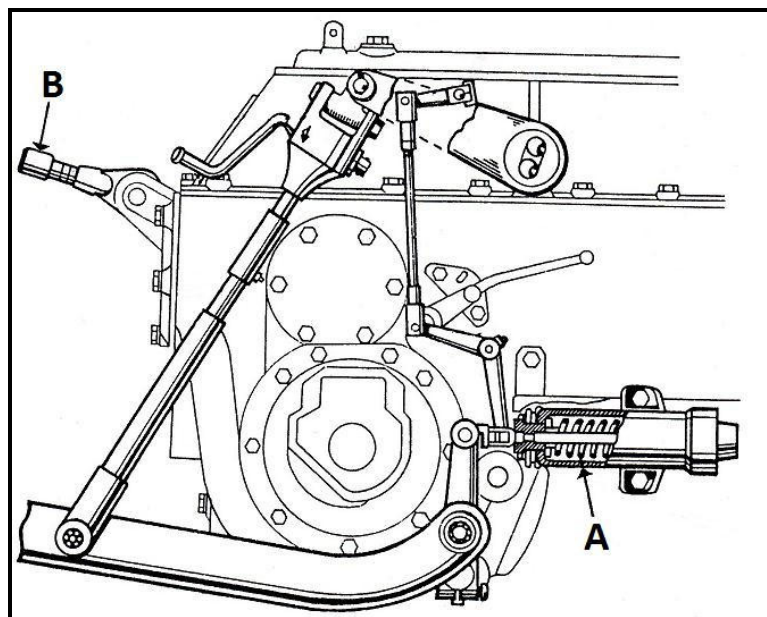
DEVICE	USE
<p>5.3.1</p> 	<p>A. wheel-locking mechanism used in 4x4 vehicles</p>
<p>5.3.2</p> 	<p>B. a device that facilitates a drive shaft to operate at an angle</p>
<p>5.3.3</p> 	<p>C. provides two-directional force</p>
<p>5.3.4</p> 	<p>D. transfer drive from the tractor to the drawn implement</p>
<p>5.3.5</p> 	<p>E. used to hitch a trailer to a tractor's tow bar</p>

(5)

- 5.4 The baling machine in photo **A** makes round bales and the baler in photo **B** makes rectangular bales.






- 5.4.1 Write, in tabular form, TWO advantages and TWO disadvantages of EACH type of baler. (8)
- 5.4.2 Name TWO methods that can be used to load large bales onto a trailer. (2)
- 5.4.3 Certain safety measures need to be followed when bales are transported to a shed. State TWO of these safety measures. (2)
- 5.5 The three-point mechanism on a tractor is connected to different implements to perform a variety of primary and secondary cultivation tasks.



- 5.5.1 Name the part that enables the lifting arms to start moving. (1)
- 5.5.2 Name part **A**. (1)
- 5.5.3 Explain what will happen to the plough if the top link, labelled **B**, is not connected when the tractor starts moving forward. (2)

- 5.6 Single- and double-action hydraulic cylinders are commonly used in farm equipment for various purposes. Identify the types of hydraulic cylinders shown in the pictures below.

5.6.1 Car jack	5.6.2 Excavator	5.6.3 Hydraulic press
		

(3)
[40]

QUESTION 6: WATER MANAGEMENT**Start this question on a NEW page.**

- 6.1 Study the picture of a centre-pivot irrigation system below and answer the questions that follow.



- 6.1.1 State TWO advantages of using this irrigation system. (2)
- 6.1.2 Name TWO communication devices that a farmer can use to effectively control the system. (2)
- 6.1.3 Name TWO tips a farmer must consider before choosing the type of fertiliser to apply through a centre-pivot irrigation system. (2)
- 6.2 Study the two water pumping methods below and answer the questions that follow.

A**B**

- 6.2.1 When would a farmer prefer pump **A** over pump **B**? (3)
- 6.2.2 List THREE factors to consider when choosing a new pump for an irrigation field. (3)
- 6.2.3 Give THREE reasons why PVC pipes are preferred over steel pipes to supply water to an irrigation system. (3)
- 6.2.4 The water source in picture **A** has a volume of 72 000 litres. The pump has a pump capacity of 120 l/min. Calculate the time it will take to empty the water source. Show ALL calculations. (4)

- 6.3 Name TWO types of drainage systems that can be used to remove excess water around the buildings of a dairy farm. (2)
- 6.4 Name TWO different water purification methods that can be used to purify brackish water. (2)
- 6.5 Study the image of a home sewage water treatment system below and answer the questions that follow.



- 6.5.1 Explain the construction and working of the distribution field that is connected to the septic tank. (3)
- 6.5.2 Give TWO reasons why a distribution field should NOT be built near drinking water installations or boreholes. (2)
- 6.6 Name TWO instances where VRT (variable rate technology) can be used in precision farming. (2)
- [30]**

TOTAL SECTION B: 160
GRAND TOTAL: 200

