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SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

AGRICULTURAL TECHNOLOGY

2023

MARKS: 200

TIME: 3 hours

This question paper consists of 17 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 ... cutting apparatus uses a tungsten electrode to carry an electrical arc for cutting metals.
- A water jet
 - B laser
 - C plasma
 - D oxyacetylene
- 1.1.2 Which ONE of the following gases is NOT suitable for use during the plasma-cutting process?
- A Acetylene
 - B Nitrogen
 - C Argon
 - D Oxygen
- 1.1.3 Which ONE of the following statements is NOT an advantage of MIG welding?
- A No need to change the electrode constantly
 - B Can be used in windy conditions
 - C The process is easily automated
 - D Better welding pool visibility because of the absence of slag
- 1.1.4 This type of metal makes welding difficult and it is recommended that the surface area is removed with a grinder:
- A Titanium
 - B Copper
 - C Stainless steel
 - D Galvanised metal
- 1.1.5 An advantage of using an inverter welder is that ...
- A no slag needs to be removed after the welding process.
 - B copper can be welded.
 - C it is lightweight and easy to carry around.
 - D no electricity is needed.

- 1.1.6 The turbine that generates electrical energy in a hydroelectric power station is connected to a ...
- A generator.
 - B stator.
 - C photovoltaic cell.
 - D solar cell.
- 1.1.7 This part of a septic drain system allows a person to inspect the inside of the drain system:
- A Distribution field
 - B Manhole
 - C Hopper
 - D Baffle
- 1.1.8 Excessive wind speed of a combine harvester causes ...
- A kernels to be blown out by the blower of the machine.
 - B kernels of different sizes to be collected in the collection bin.
 - C V-belts to be thrown from their pulleys.
 - D kernels not being removed from the stalks.
- 1.1.9 A ... prevents pressure build-up in the tank of a septic drain.
- A ventilation opening
 - B flashback arrester
 - C type of bacterium
 - D venturi
- 1.1.10 The adhesive that is the most suitable for assembling the glass panels of an aquarium:
- A Epoxy
 - B Silicon
 - C Resorcinol
 - D Latex
- (10 x 2) (20)

- 1.2 Change the UNDERLINED word(s) in the following sentences 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 The welding plane continuously changes as the welder welds a run in the fixed pipe welding position.
- 1.2.2 Cladding is the welding process that is used to build up a plough shear by padding it with a wear-resistant metal.
- 1.2.3 The push direction is stronger than the pull direction of the hydraulic cylinder because a larger stroke length is subjected to the oil pressure.
- 1.2.4 A bearing is a machine component that creates friction between a moving component and a shaft.
- 1.2.5 The pick-up mechanism on a ram-type baler moves in and out to feed the hay into the baling chamber. (5 x 2) (10)
- 1.3 Choose a word/term in COLUMN B that matches the description in COLUMN A. Write only the letter (A–J) next to the question numbers (1.3.1 to 1.3.5) in the ANSWER BOOK, e.g. 1.3.6 K.

COLUMN A		COLUMN B	
1.3.1	This happens when steel is heated to a high point and then cooled down again	A	expansion
		B	cast iron
1.3.2	Occurs on the surface of certain metals because of oxidation	C	shrinking
		D	electrolysis
1.3.3	The material that is used in the manufacturing of tractor engine blocks where weight plays an important role	E	reverse osmosis
		F	rust
1.3.4	The technology that controls the application rate of fertiliser on a precision planter	G	VRT
		H	mechanical timer
1.3.5	A garden irrigation controller that does not need an external power source	I	tensiometer
		J	aluminium

(5 x 2) (10)

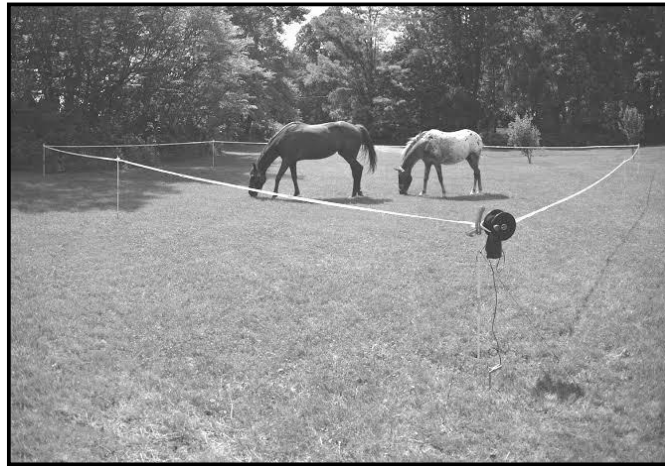
TOTAL SECTION A: 40

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

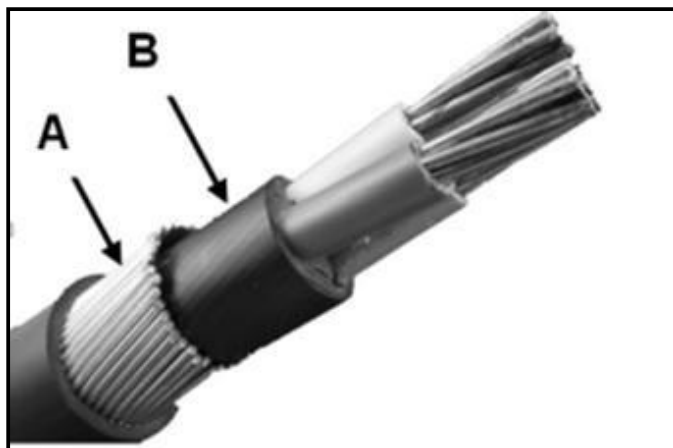
Start this question on a NEW page.

- 2.1 Machining Vesconite holds no health risks for the persons working with it.
- 2.1.1 Explain the statement above by giving THREE reasons to confirm the answer. (3)
- 2.1.2 Name TWO products that could be manufactured from Vesconite. (2)
- 2.2 Answer the following questions regarding tin.
- 2.2.1 What is the colour of tin? (1)
- 2.2.2 Name THREE instances where tin alloys are used commercially. (3)
- 2.3 Stainless steel is an alloy steel that can be used in various applications on the farm.
- How can the magnetism property of stainless steel be reduced without affecting its tensile strength? (1)
- 2.4 Internal stress is induced in brass when it is cold worked. Describe the process of relieving this internal stress without compromising the properties of brass. (2)
- 2.5 Name TWO uses of phosphor bronze. (2)
- 2.6 Genkem contact adhesive is a strong, fast-drying, multipurpose adhesive designed to provide good adhesion properties when applied to a wide variety of household materials.
- 2.6.1 Name FOUR household materials to which Genkem contact adhesive can be applied effectively. (4)
- 2.6.2 Recommend FOUR ways to improve the strength of the joint when applying a contact adhesive. (4)

- 2.7 The picture below shows a type of animal fence used to restrict the movement of horses.



- 2.7.1 Identify the type of fence shown in the picture and give a reason for using this type of fence. (2)
- 2.7.2 What is the function of the energiser used in the type of fence identified in QUESTION 2.7.1? (2)
- 2.7.3 Name THREE properties of the isolators that are used to fix the wire of an electric fence to the posts. (3)
- 2.7.4 What will happen if a person touches an electric fence that has a higher amperage than is prescribed by law? (2)
- 2.8 Identify parts **A** and **B** and state ONE function of each.

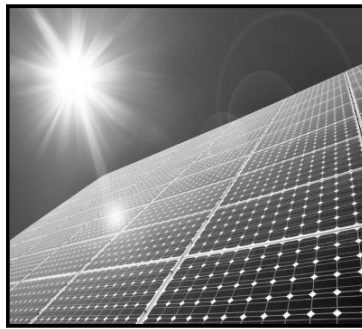


(4)
[35]

QUESTION 3: ENERGY

Start this question on a NEW page.

- 3.1 Study the pictures of two alternative energy systems labelled **A** and **B** below and answer the questions that follow.

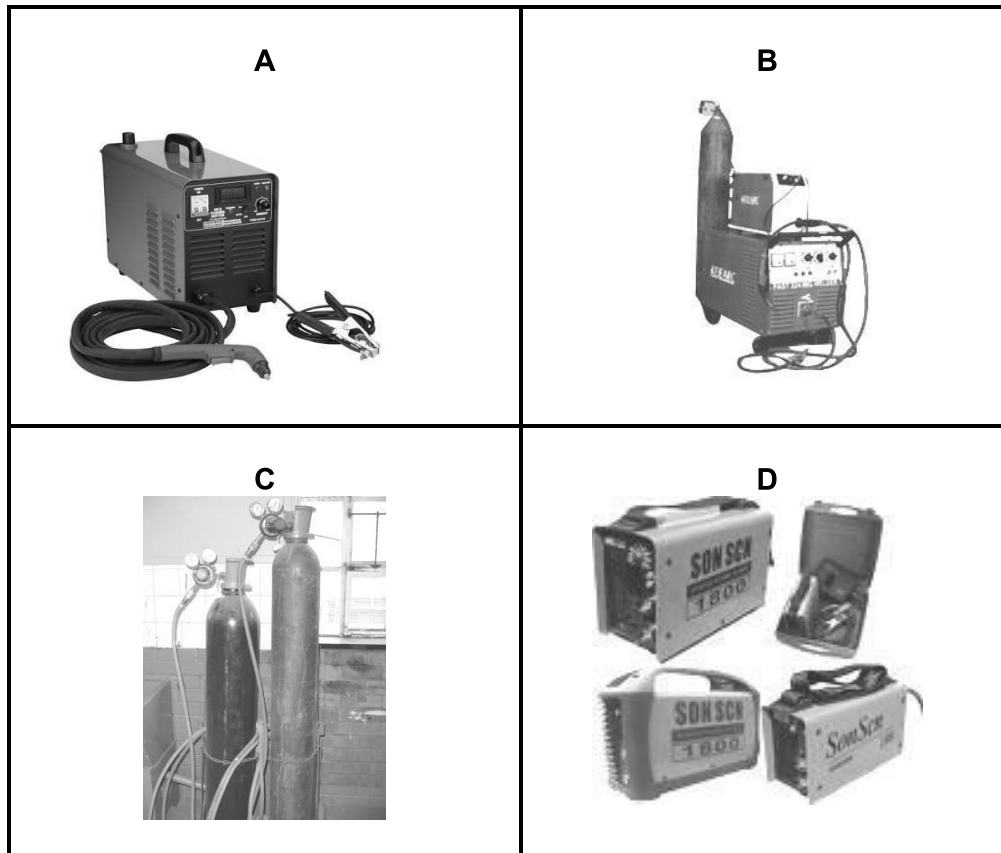
**A****B**

- 3.1.1 Which ONE of the systems, **A** or **B**, is suitable to provide electricity to a water pump in a valley or mountainous area? Give a reason for your answer. (2)
- 3.1.2 State THREE advantages of system **A** when compared to system **B**. (3)
- 3.2 State THREE disadvantages of solar geysers. (3)
- 3.3 Name THREE problems associated with an electric power station that uses coal as an energy source. (3)
- 3.4 Describe the process of harnessing geothermal energy from the Earth to produce electricity. (6)
- 3.5 Name THREE benefits of methanol when it is used as a supplement fuel for a vehicle. (3)
- [20]**

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

Start this question on a NEW page.

4.1 The pictures below show important equipment that is used on a farm.



Choose a picture above that will match each of the following scenarios. Write only the letter (A–D) next to the question numbers (4.1.1 to 4.1.5), e.g. 4.1.6 E.

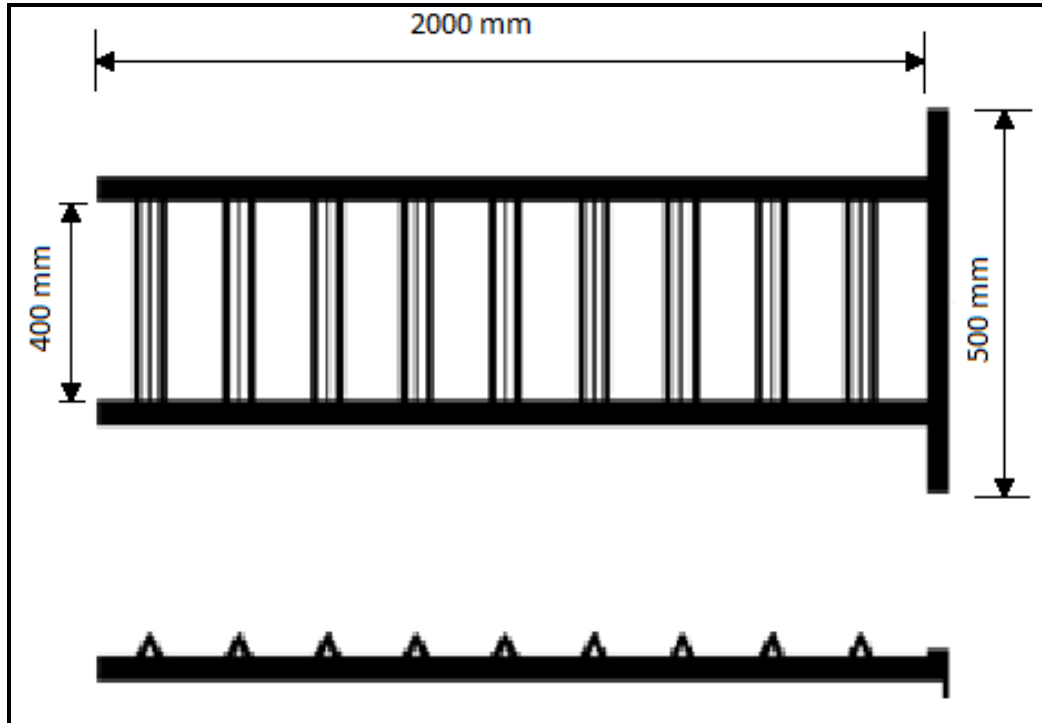
- | | | |
|-------|---|-----|
| 4.1.1 | The cutting of corroded metal where electricity is not available | (1) |
| 4.1.2 | A compact welding machine, connected to a generator, is used to repair a farm gate in the field | (1) |
| 4.1.3 | Precision cutting of metal without using acetylene | (1) |
| 4.1.4 | Welding machine that does not need to have the welding rod replaced regularly | (1) |
| 4.1.5 | The machine that does not use gas when operated | (1) |

- 4.2 A farmer needs to build a ramp to load his motorbike onto his pickup truck. The ramp needs to be manufactured from angle iron.

Study the design drawing of the ramp below and use the dimensions of the material that are provided to answer the questions.

Angle iron for outside frame: 32 mm x 32 mm x 5 mm = R95,00/metre

Angle iron for steps: 25 mm x 25 mm x 3 mm = R43,00/metre



- 4.2.1 Study the table below and re-arrange the steps of the manufacturing process in the correct sequence, e.g. 6, 9, 7, 10, 8.

STEPS	MANUFACTURING PROCESS
1	Clean the surface area where welding will take place.
2	Use the appropriate equipment to cut the angle iron into the correct lengths.
3	Finish off and paint the ramp.
4	Measure and mark the correct lengths of the angle iron.
5	Spot-weld to ensure that the ramp components are fixed in place and then complete the welding process.

(5)

- 4.2.2 Use the information above to calculate the total cost of the angle iron that must be purchased to build the ramp.

(5)

- 4.3 Study the picture below of a component that is used on the MIG welding apparatus and answer the questions that follow.

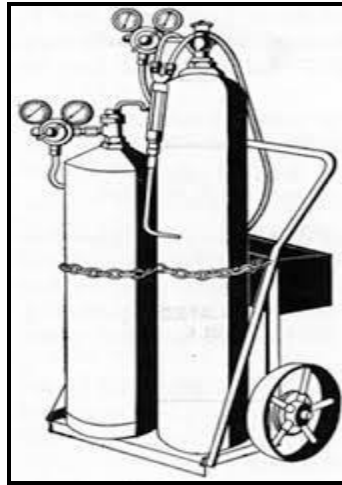


- 4.3.1 Name the component. (1)
- 4.3.2 Explain the importance of setting the component to deliver the correct gas pressure before starting with the welding process. (4)
- 4.3.3 What is the recommended gas pressure setting for effective welding to take place? (1)
- 4.4 The picture below shows a person welding in the overhead arc welding position.



- 4.4.1 Describe the overhead arc welding process. (5)
- 4.4.2 Identify a safety measure that is taken by the welding operator to protect himself. Give a reason for your answer. (2)

- 4.5 The oxyacetylene apparatus shown below is used for cutting and welding purposes.



- 4.5.1 Name THREE types of personal protective equipment that must be worn when performing a cutting task with the oxyacetylene cutting apparatus. (3)
- 4.5.2 Name the cylinder that needs to be opened first before cutting commences. Give ONE reason for your answer. (2)
- 4.5.3 It is recommended that both the cylinders always be used in an upright position.
- Do you agree with this statement? Motivate your answer. (2)

[35]

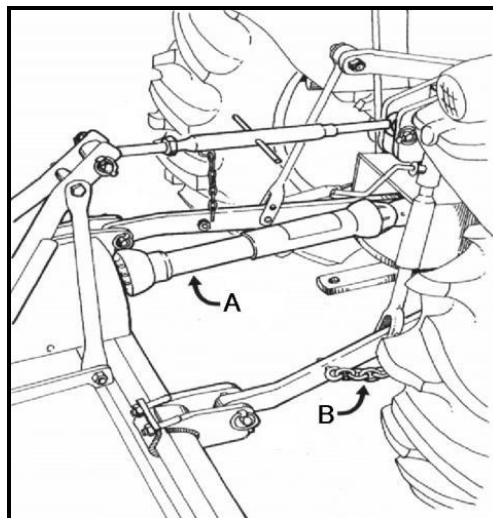
QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

Start this question on a NEW page.

- 5.1 Study the pictures of TWO types of silage cutters below and answer the questions that follow.

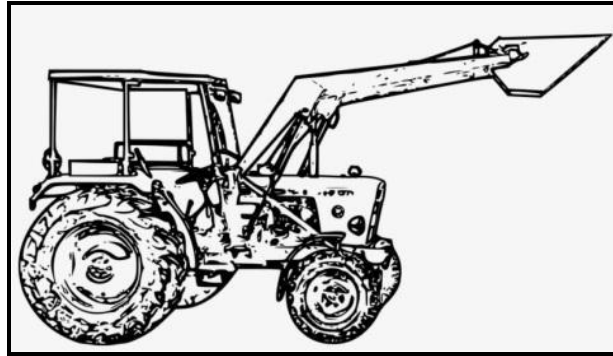


- 5.1.1 State FOUR mechanical problems that may be experienced with the cutting mechanism of the machine in picture **A**. (4)
- 5.1.2 Choose between **A** and **B** the most suitable silage cutter a small-scale farmer can use to harvest his silage. Motivate your answer. (3)
- 5.1.3 Describe the procedure that must be followed when the machine shown in picture **A** is prepared for use. (5)
- 5.2 Study the illustration of the three-point hydraulic system of a tractor below and answer the questions that follow.



- 5.2.1 Why is it important to have grease nipples installed on the universal joints of the power take-off (PTO) shaft? (1)
- 5.2.2 Describe the function of component **B**. (1)
- 5.2.3 Component **A** must always be screened off to prevent serious injuries. State THREE requirements of this type of screen. (3)

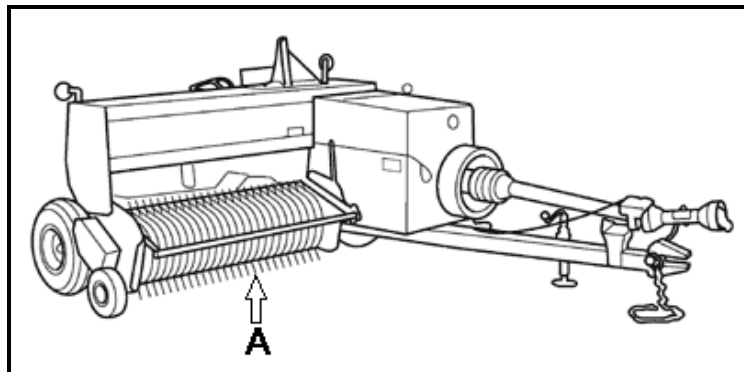
5.3 The illustration below shows a tractor equipped with a front-end loader.



5.3.1 State FOUR requirements that must be considered before buying a tractor that needs to be equipped with a front-end loader. (4)

5.3.2 State FOUR safety precautions to keep in mind when working against a slope with a front-end loader. (4)

5.4 The ram-type baler shown below is used to produce small rectangular bales.

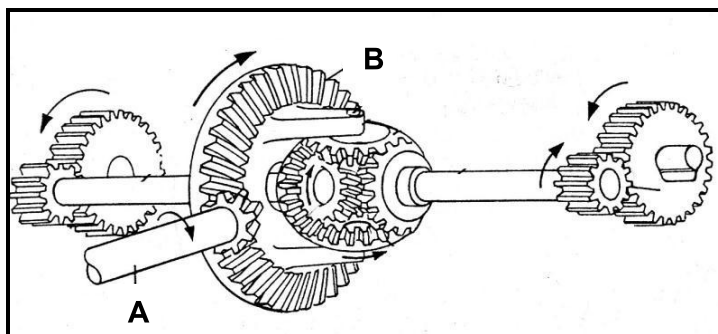


5.4.1 Name part **A**. (1)

5.4.2 Explain how to change the bale density of a ram-type baler. (2)

5.4.3 Describe the functions of the slip clutch on the ram-type baler. (3)

- 5.5 The illustration below shows a differential that is used in the drive mechanism of a tractor.



- 5.5.1 Explain the reason for installing a differential on a tractor. (2)
- 5.5.2 Name parts **A** and **B** in the illustration. (2)
- 5.6 Defective diesel engines always show certain visible signs. Complete the table below by filling in the missing words. Write the missing word next to the question numbers (5.6.1 to 5.6.3) in the ANSWER BOOK.

SYMPTOM	DEFECT ON TRACTOR
Black smoke	5.6.1
5.6.2	Water leaks into combustion chamber.
Blue smoke	5.6.3

(3)

- 5.7 Study the picture below and answer the questions that follow.



- 5.7.1 Name the tool shown in the picture above. (1)
- 5.7.2 Name the power source that is used to provide drive to this tool. (1)

[40]

QUESTION 6: WATER MANAGEMENT

Start this question on a NEW page.

6.1 The picture below shows a movable sprinkler irrigation system.



6.1.1 Explain why this irrigation system is the most effective one to use on small areas in irrigation fields. (4)

6.1.2 Describe the working of this irrigation system. (4)

6.2 The picture below shows a sprinkler of a centre-pivot irrigation system that is connected to a variable-rate technology (VRT) applicator.



6.2.1 Explain the reason for connecting an irrigation sprinkler to a variable-rate applicator. (1)

6.2.2 Give TWO reasons for positioning the sprinklers at a specific height above the crop. (2)

6.3 Explain the term *irrigation scheduling*. (2)

- 6.4 Name FOUR aspects that need to be considered before choosing a suitable site to build a septic tank system. (4)
- 6.5 Identify a drainage system that can be used in the following scenarios:
- 6.5.1 To remove large amounts of rainwater from suburban areas (1)
- 6.5.2 To remove excess water from lawns (1)
- 6.6 Describe how computer software can be used effectively in a modern irrigation system. (2)
- 6.7 Name TWO devices that can be used to measure evapotranspiration in a field. (2)
- 6.8 State TWO disadvantages of using distillation as a water purifying method. (2)
- 6.9 Describe the process of water filtration with a jug filtration system. (2)
- 6.10 Give THREE reasons for fitting farm machinery with a GPS unit. (3)
- [30]**

TOTAL SECTION B: 160
GRAND TOTAL: 200