basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

AGRICULTURAL TECHNOLOGY

NOVEMBER 2011

MARKS: 200

TIME: 3 hours

This question paper consists of 15 pages and 1 answer sheet.

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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.

2. SECTION A: MULTIPLE-CHOICE QUESTIONS

    2.1 Answer the questions from this section on the attached ANSWER SHEET.

    2.2 Follow the instructions when answering the multiple-choice questions.

    2.3 Place the COMPLETED ANSWER SHEET in the ANSWER BOOK.

3. SECTION B: STRUCTURED QUESTIONS

    3.1 This section consists of FIVE questions.

    3.2 Answer the questions from this section in the ANSWER BOOK.

    3.3 Number the answers correctly according to the numbering system used in this question paper.

    3.4 Start EACH question on a NEW page.

    3.5 It is in your own interest to pay attention to the accuracy and neatness of your work.

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SECTION A

QUESTION 1

Various options are provided as possible answers to the following questions. Choose the answer and make a cross (X) in the block (A–C) next to the question number (1.1–1.20) on the attached ANSWER SHEET.

EXAMPLE:

1.0	~~A~~	B	C

1.1 Overhead power lines carry a voltage of 11 000 volts which must be reduced by means of a … in order to provide the 380 volts necessary to run pumps for irrigation purposes.

A transformer
B generator
C alternator (2)

1.2 The carbon monoxide gas given off by the exhaust system of a petrol engine is …

A poisonous under dry conditions.
B poisonous under moist conditions.
C poisonous under all conditions. (2)

1.3 People can get infected with HIV and Aids under the following conditions:

A By not wearing gloves when handling injured people
B By sharing eating utensils
C When safety boots are not worn in the workplace (2)

1.4 Pneumatic tools use … to drive them.

A oil
B air pressure
C water (2)

1.5 The MIG welding process uses inserted gas as a … between the molten puddle and the surrounding atmosphere.

A welding flux
B welding paste
C shield (2)

1.6 Farmers and workers must study the …Act concerning certain safety rules relevant in the workshop.

A Labour
B DoE
C OHS (safety) (2)

1.7 Energy obtained from earth gas, like methane, is called … energy.

A nuclear
B geothermal
C bio- (2)

1.8 The levelling box on the three-point coupling of a tractor is used to set the … of a hitched implement, like a plough.

A top link
B sensitivity element
C cross-angle setting (2)

1.9 Worn out piston rings is the reason for … emissions from the exhaust of a diesel tractor.

A white smoke
B dark mixture
C blue smoke (2)

1.10 A computer system capable of capturing, storing, analysing and displaying geographical reference information/data according to location, is called a …

A GIS.
B GPS.
C VRT. (2)

1.11 The ratio shown on a drawing plan refers to the scale drawing in relation to the end product:

A 1 : 50
B 1 : 25
C A and B (2)

1.12 To prevent loose soil and stones from falling into a borehole, the borehole should be …

A lined.
B fenced off.
C covered with a lid. (2)

1.13 A water tank is placed on a stand near a water trough. Choose a suitable material for the manufacturing of the water tank from the following:

A Wood
B Rubber
C Plastic (2)

1.14 Which of the following is applicable when working with an angle grinder?

A Always wear goggles
B Guards should be in place
C Both A and B (2)

1.15 When welding a metal project, the technique of joining will be indicated by a welding symbol. Identify the symbol that indicates that welding is needed on both sides of the joint:

A
B 
C  (2)

1.16 When using electrical appliances users can be accidentally shocked due to faulty wiring. Which ONE of the following is designed to protect the user?

A Earth-leakage switch
B Circuit breaker
C Overload protector (2)

1.17 Three-phase motors are used to drive heavy equipment on farms, such as pumps and hammer mills. What is the voltage used by three-phase motors in South Africa?

A 380 V
B 240 V
C 120 V (2)

1.18 Various communication systems are available for use on a farm. Which ONE of the following is a practical way to inform neighbours of a veld fire?

A Two-way radios, telephones and cellphones
B Local newspapers
C Agricultural magazines (2)

1.19 When inspecting a tractor's mechanical systems, it is important to be on the lookout for ...

A leakages in any system.
B paint of the tractor.
C rust. (2)

1.20 According to the fire prevention rules a dry powder extinguisher can be used to extinguish …

A veld fires.
B all types of fire in a workshop.
C an electrical fire. (2)

TOTAL SECTION A: 40

SECTION B

QUESTION 2: MATERIALS AND STRUCTURES

2.1 Metal is often used in materials and structures on the farm. Answer the following questions on metals.

2.1.1 Name any THREE non-ferrous metals often used on farms. (3)

2.1.2 Alloys are a combination of two or more metals melted together to form a new metal with new properties. Complete the table below in your ANSWER BOOK to show which metals are used to form the alloys as shown:

ALLOY	METALS
(a) Stainless steel	
(b) Brass	
(c) Solder	

(3)
(2)
(2)

2.2 Answer the following questions on adhesives used in materials and structures.

2.2.1 Name the TWO most important aspects to consider when an adhesive is chosen for a specific job. (2)

2.2.2 Teflon is a polymer product which shows exceptional resistance to some factors. Name any TWO of these factors. (2)

2.2.3 Name any THREE safety measures when using synthetic materials. (3)

2.3 Farms cannot function properly without certain buildings. Answer the following questions on building structures on the farm.

2.3.1 Name the size of a normal foundation as stipulated in the code for building. (2)

2.3.2 Describe the function of lintels in a building. (2)

2.3.3 Name any THREE types of material that can be used as roof coverings. (3)

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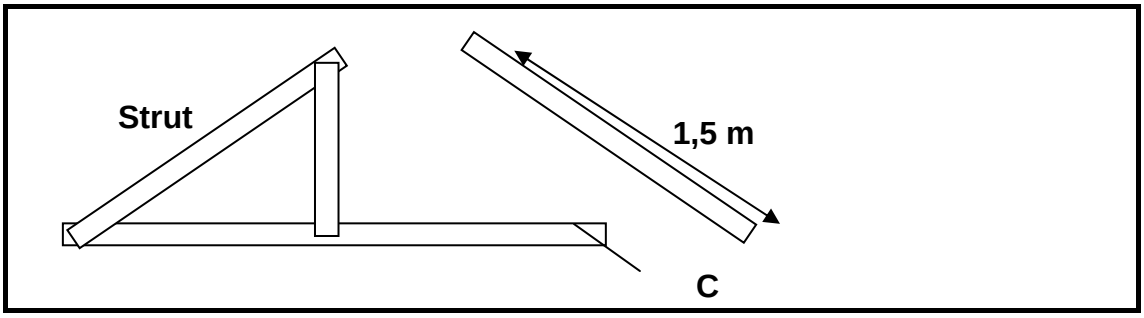
2.4 Answer the following questions on roofs.



2.4.1 Indicate the section of the roof truss labelled **C**. (1)

2.4.2 The timber (4 500 mm x 100 mm x 25 mm) had to be cut into various lengths. Describe the procedure and tools used to cut a piece of wood 1,5 m long. (4)

2.4.3 Name the type of insulation material that can be used between the roof and ceiling to keep a shed cool in summer and warm in winter. (1)

2.5 Answer the following questions on electric fences.

2.5.1 Name TWO methods to prevent lightning from damaging the energiser used in electric fencing. (2)

2.5.2 Electrical fences on a farm are not always the answer to a farmer's problem. Discuss the disadvantages of electrical fences. (3)
[35]

QUESTION 3: ENERGY

3.1 To generate wind power you need to be able to capture energy from the force of the wind by using a device similar to the one shown in the picture below.

3.1.1 Briefly describe how this wind energy generator works. (3)

3.1.2 Before purchasing a small wind turbine for the farm, the farmer should consider some of the factors which meet the requirements for installing a wind turbine. Explain FIVE requirements the farmer should consider. (5)

3.2 Using solar panels to heat water is becoming increasingly popular around the world due to the advantages associated with this method.

3.2.1 Name TWO advantages of using solar energy. (2)

3.2.2 Explain the circulation of hot water through a solar panel and a typical geyser. (4)

3.3 The increasing price of crude oil is the main reason why biofuel offers a cheaper solution to our energy needs. Explain THREE advantages of biofuels. (3)

3.4 The following alternative fuels are of plant origin. Give ONE example of EACH of the following:

3.4.1 Methanol (1)

3.4.2 Ethanol (1)

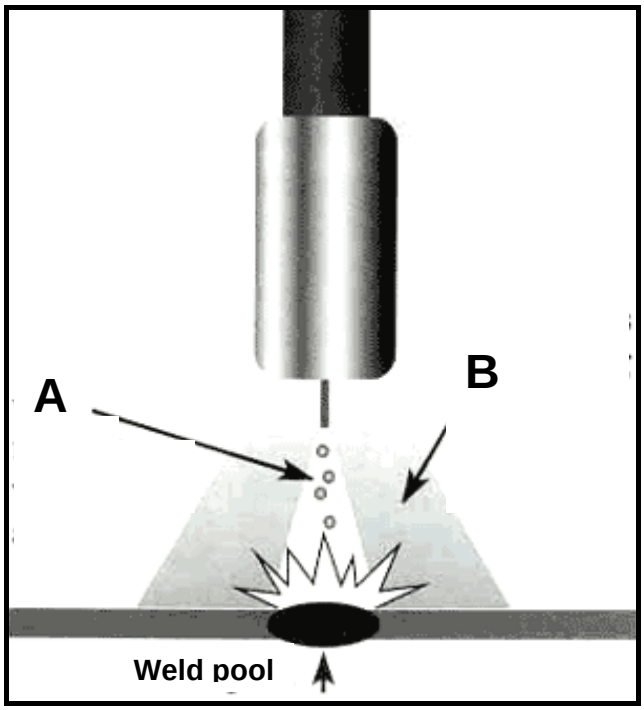
3.4.3 Methane gas (1)

[20]

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

4.1 Make a neat, labelled drawing of the right-hand welding technique when using the oxy-acetylene welding apparatus and indicate the thickness of the metal to be welded. (10)

4.2 Answer the following questions on the MIG welding process as shown in the sketch below.

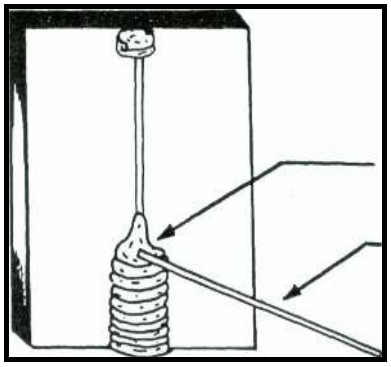


4.2.1 Identify the substance indicated by arrow **A**. State the function of **A**. (2)

4.2.2 State the name and function of the part labelled **B** in the MIG welding process. (2)

4.2.3 Name the THREE different gases used in the MIG welding process. (3)

4.3 The sketch below shows the vertically upwards arc-welding process.



4.3.1 Briefly describe this welding process. (6)

4.3.2 Name THREE factors that influence distortion of a welding run. (3)

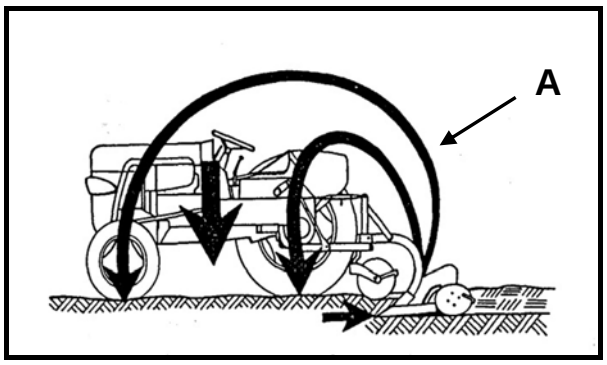
4.3.3 Name THREE ways of controlling distortion caused by the heat of welding runs. (3)

4.3.4 Describe the process of shrinking welding joints. (3)

4.4 Explain the process of hard-facing. (3)
[35]

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

5.1 The illustration below shows a tractor pulling a plough.



5.1.1 Briefly describe what arrow **A** illustrates. Give a reason for your answer. (2)

5.1.2 Explain THREE factors that have an influence on the depth-control system of a tractor. (3)

5.2 Flat belts are commonly used on farms to drive a variety of different machines and implements.

5.2.1 Discuss FIVE advantages of the use of flat drive belts between a power source and a pump. (5)

5.2.2 Safety screens installed on machines and farm implements must comply with certain requirements. Name any FOUR of these requirements. (4)

5.3 All farm implements and tractor spares should comply with certain requirements like being interchangeable. Describe any FOUR advantages of the standardisation of spare parts. (4)

5.4 The picture below shows a silage-cutting machine. Answer the questions that follow.

5.4.1 Name THREE safety precautions that should be followed when using this machine. (3)

5.4.2 Describe the procedure to follow when this silage-cutting machine is prepared for use. (5)

5.5 Describe the role of computers and satellite-positioning systems in modern combine harvesters. (4)

5.6 Name ONE other method of maize harvesting. (2)

5.7 Why should cultivators be set to work effectively? (1)

5.8 A hammer mill is essential when farming with livestock.

5.8.1 Name the factors that have to be considered when a hammer mill is bought. (4)

5.8.2 Identify THREE major causes of metal fatigue in hammer mills. (3)
[40]

QUESTION 6: WATER MANAGEMENT

6.1 Answer the following questions on water scheduling.

6.1.1 Irrigation scheduling is used by irrigation managers to determine the correct frequency, duration and quantity of water to be applied for irrigation purposes at the correct time. Give TWO reasons for irrigation scheduling. (2)

6.1.2 Name TWO pieces of equipment that can be used to determine the evaporation in a specific field. (2)

6.2 Drainage is a process to remove excess or free water from the upper layers of waterlogged soil.

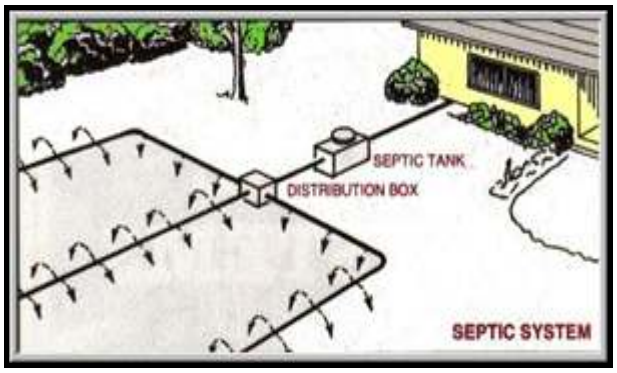
6.2.1 Name FOUR types of closed drainage systems. (4)

6.2.2 Give TWO reasons why it is sometimes necessary for the farmer to determine the flow rate in a pipe delivery system. (2)

6.2.3 Calculate the flow rate of water in a pipe delivery system by using the following data:

The capacity of the tank is 8 000 litres
It took 8 hours to fill the tank to the top (4)

6.3 The picture below shows a septic system on a farm. Answer the questions that follow.



6.3.1 Briefly describe how a septic tank operates. (3)

6.3.2 If properly maintained, a well-designed drainage system will last almost indefinitely. Name TWO problems that can occur if a system is neglected for a long time. (2)

6.3.3 Explain the important measures that should be taken into account by users of a septic tank system for the system to function properly. (5)

6.3.4 Briefly describe the factors to consider when a farmer plans to build a new septic tank. (4)

6.4 Irrigation pipes are often buried underneath the soil. Name TWO precautionary measures that should be taken when these pipes are laid. (2)

[30]

TOTAL SECTION B: 160
GRAND TOTAL: 200

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ANSWER SHEET

CENTRE NUMBER: | | | | | | | | |

EXAMINATION NUMBER: | | | | | | | | | | | | | |

SECTION A

QUESTION 1

1.1	A	B	C
1.2	A	B	C
1.3	A	B	C
1.4	A	B	C
1.5	A	B	C
1.6	A	B	C
1.7	A	B	C
1.8	A	B	C
1.9	A	B	C
1.10	A	B	C
1.11	A	B	C
1.12	A	B	C
1.13	A	B	C
1.14	A	B	C
1.15	A	B	C
1.16	A	B	C
1.17	A	B	C
1.18	A	B	C
1.19	A	B	C
1.20	A	B	C

TOTAL SECTION A: (20 x 2) 40

TOTAL:

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GRADE 12

AGRICULTURAL TECHNOLOGY

NOVEMBER 2011

MEMORANDUM

MARKS: 200

This memorandum consists of 11 pages.

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SECTION A

QUESTION 1

1.1	**X**	B	C
1.2	A	B	**X**
1.3	**X**	B	C
1.4	A	**X**	C
1.5	A	B	**X**
1.6	A	B	**X**
1.7	A	B	**X**
1.8	A	B	**X**
1.9	A	B	**X**
1.10	**X**	B	C
1.11	A	B	**X**
1.12	**X**	B	C
1.13	A	B	**X**
1.14	A	B	**X**
1.15	A	**X**	C
1.16	**X**	B	C
1.17	**X**	B	C
1.18	**X**	B	C
1.19	**X**	B	C
1.20	**X**	**X**	**X**

TOTAL SECTION A: 40

SECTION B

QUESTION 2: MATERIALS AND STRUCTURES

2.1 2.1.1
- Copper✓
- Lead✓
- Tin✓
- Aluminium
- Zinc
- Brass (Any 3)

(3)

2.1.2

ALLOY	METALS	
(a) Stainless steel	Manganese, ✓Chromium, ✓ Nickel✓	(3)
(b) Brass	Copper, ✓ Tin✓	(2)
(c) Solder	Lead✓, Tin✓	(2)

2.2 2.2.1 Type of material to be joined. ✓
Conditions under which this joint will be used. ✓ (2)
(Can provide an example)

2.2.2 High temperatures ✓
Chemical reactions ✓
Corrosion
Stress cracking (Any 2) (2)

2.2.3
- Catalyst and accelerator should always be stored separately. ✓ (Explosion)
- Remove all resin catalyst and accelerator from skin. ✓
- Wear gloves if skin is sensitive. ✓
- Only use acetone in well-ventilated room.
- Handle resin casting carefully because they are brittle.
- Do not breathe in glass fibre (3)
- Do not get it in your eyes. (Any 3)

2.3 2.3.1 600 x 230 mm ✓✓ (2)

2.3.2 Lintels act as support
over window✓ and door openings ✓ (2)

2.3.3
- Tiles/Slash stone ✓
- Corrugated galvanised iron sheets, IBR ✓
- Grass / Thatch / Reeds ✓
- Asbestos
- Concrete slabs
- Fibre glass
- Glass (Any 3)

(3)

2.4 2.4.1 Beam ✓ (1)

2.4.2
- Measure the length 1,5 m with a tape ✓
- Mark it off with pencil ✓
- Saw the wood at marked length with saw ✓
- File/sand rough edging ✓(Any 2 tools and any 2 descriptions) (4)

2.4.3 Pink aerolite ✓or any effective insulating material. (1)

2.5 2.5.1 Install lightning conductors/arrestor/earthed✓
Switch off all electricity during thunderstorms.✓ (2)

2.5.2 Potential for the entire fence to be disabled due to a brake in any conducting wire✓
Shorting out if the conducting wire makes contact with any non-electrified components of the fence. ✓
Power failures✓
Veld fires due to dry vegetation touching the wires.
Children or pets touching wires by accident
(Any correct acceptable answer will be accepted) (Any 3) (3)
[35]

QUESTION 3: ENERGY

3.1 3.1.1
- Wind turbine with a propeller blade type design. ✓
- The propeller captures wind energy, used to drive a turbine.✓
- The turbine is attached to a generator, which enables the generator to produce power. ✓ (3)

3.1.2
- Cost effectiveness and efficiency. ✓
- Wind speed to generate adequate electricity efficiently. ✓
- Open spaces are more suitable.✓
- Do not use in mountainous area.✓
- Do not use near forests.✓
- Expert advice should be gained before purchasing a wind turbine,
- It can be connected to your power supply to provide your home with an extra boost in electricity
- Wind energy technology can be combined with other alternative energy sources of energy. (5)
- Amount of energy needed
- (Any 5)

3.2 3.2.1
- Solar power is limitless. ✓
- Environmentally friendly energy source/ No pollution.✓
- Transition losses are limited.
- Does not use a lot of space.
- Low maintenance
- Installation is relative cheap and simple (Any 2) (2)

3.2.2 The sun heats up the water in the solar panels, the heated water always ri ses to the highest point in a closed system. ✓
The heated water enters the geyser through a closed copper pipe network that runs through the geyser. ✓
The hot water inside the copper pipes heats up the cold water inside the geyser✓
and then flows downwards back to the solar panel where it is reheated. ✓ (4)

3.3
- Low cost. ✓
- Biodegradable. ✓
- Less pollution - environment friendly. ✓
- Regenerate faster than conventional fuels.
- Engines do not require any radical changes to switch to the use of biofuels.

(Any 3) (3)

3.4 3.4.1 woody plant fibre or natural gas.✓ (Any 1) (1)

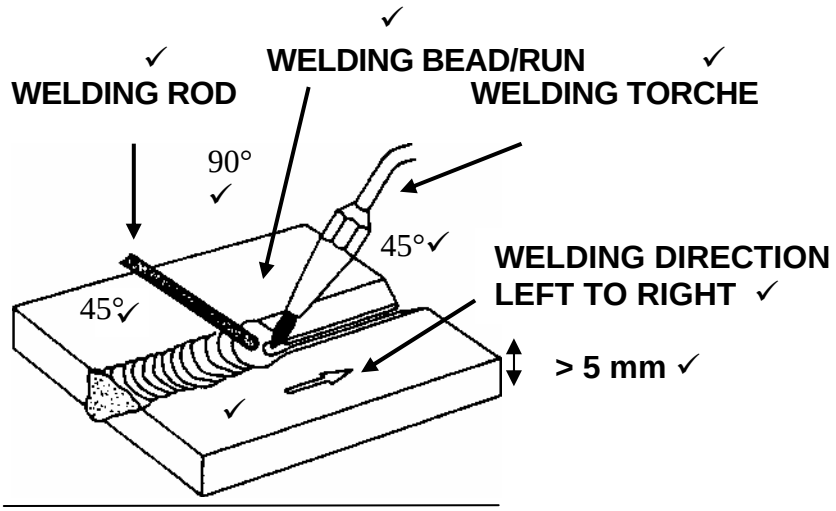
3.4.2 maize, sorghum, potatoes, wheat, sugar-cane, cornstalks, fruit and vegetable waste. ✓ (Any 1) (1)

3.4.3 earth gas, landfills, kraal manure, rubbish dumps and swamps. ✓ (Any 1) (1)

[20]

QUESTION 4:
SKILLS AND CONSTRUCTION PROCESSES

4.1



Neatness: 1 Mark✓ (10)

4.2 4.2.1 Droplets of filler wire/(Arc) ✓
Provides the filling metal for the fusion process/Provides the heat for the welding process. ✓ (2)

4.2.2 Shielding gas. ✓
Prevents the welding bead to come into contact with oxygen during the welding process. ✓ (2)

4.2.3 Argon, ✓
Helium ✓
Carbon dioxide (CO_2).✓ (3(

4.3 4.3.1
- Welding upwards in a vertical position may pose a problem, because the molten metal of the puddle will tend to run down.✓
- Special electrode is used for vertical welding with an arc welder, makes the process easier as it 'freezes' more quickly. ✓
- Amperage can be reduced slightly. ✓
- Tip of the electrode must be pointed upwards, so that the electrode forms an angle of up to 30°with the surface. ✓
- Arc must be kept as short as possible and the speed must be just sufficient to prevent the molten metal from the puddle to run down.✓
- When welding up very little lateral movements of the electrode must be made. ✓

(6)

4.3.2
- Amount of welding.✓
- Number of welding runs.✓
- Degree of resistance.✓

- Original state or condition of parts that must be welded.
- Welding procedure that follows
- Thickness of the metal
- Current strength (Any 3)

(3)

4.3.3
- Pre-setting of welding piece ✓
- Short welding runs ✓
- Clamping ✓
- Spot welding
- Bridging
- Lower welding current (Any 3)

(3)

4.3.4 When metal is heated, it expands and when it cools down it shrinks. ✓
The shrinking of welded metal, as well as weld runs, causes distortion of sheets when they cool down. ✓
Shrinking takes place in all directions simultaneously during cooling and therefore causes various types of distortion.✓ (3)

4.4
- It is the process by means of which worn parts✓
- can be built up by padding✓
- with a wear resistant metal.✓

(3)
[35]

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

5.1 5.1.1 The illustration shows how the plough tends to push down on the front wheels✓
when the top link is fitted between the plough and the tractor. ✓ (2)

5.1.2
- Ploughing depth. ✓
- Soil resistance. ✓
- Forward speed of the tractor. ✓ (3)

5.2 5.2.1
- Easily installed or taken off. ✓
- Used over long distances. ✓
- Easily lengthened or shortened. ✓
- Easily joined. ✓
- Used with ease to run over a pulley situated between two bearings without removing the bearings. ✓ (5)

5.2.2
- Safeguard the equipment. ✓
- Safeguard the operator. ✓
- Removed and replaced easily. ✓
- Must appear neat. ✓
- Must be properly installed. (not loosened while in motion))
- Weight saving.
- Keep out all undesired material. (Any 4) (4)

5.3
- Any implement can be used on any tractor. ✓
- The same engine and spares can be used on a variety of tractors. ✓
- Spares can be purchased from any agent instead of a specific one. ✓
- Spares can be offered to the farmer relatively cheaply, because of mass production. ✓
- A reduced quantity of spares needs to be kept in stock for maintenance and service purposes.
- When a farmer decides to purchase a new tractor, he/she will not have to take a special course to maintain it. (Any 4) (4)

5.4 5.4.1
- Do not let people or animals come near the blades or working parts of the machine while it is working. ✓
- Make sure that all safety devices are in place and in working order. ✓
- No person other than the driver may ride or climb on top of this machine. ✓ (Any acceptable answer) (3)

5.4.2
- All grease points must be well greased. ✓
- The correct tension must be set for all belts and drives. ✓
- Check that all parts are functioning correctly.✓
- Replace all warn out parts immediately especially the cutter blades.✓
- Service according to manufacturer's specifications. ✓
- Lift up all dust release guards.
- Check that there is no damage to the blades and that they are sharp. (Any 5) (5)

5.5
- Computers help to determine the yield on each specific spot on the land. ✓
- Computers help you to spot problems in advance in the mechanics of the harvester. ✓
- Helps to identify plant nutrient deficiencies on the land. ✓
- Helps to identify problem areas in your maize field. ✓ (4)

(Any acceptable answer)

5.6 Can be picked by hand/Silage cutter. ✓ (1)

5.7
- To work at the lowest fuel cost. ✓
- To control weeds effectively. ✓ (2)

5.8 5.8.1
- Sturdy construction. ✓
- Replaceable wearing parts. ✓
- Rotor housing should close tightly. ✓
- Size of the hopper feed aperture. ✓ (4)
- After sale service etc
- Energy source available (Any 4)

5.8.2
- Vibration/Loose bolt/nuts.✓
- Wear.✓
- Rust.✓ (3)

[40]

QUESTION 6: WATER MANAGEMENT

6.1 6.1.1
- To save water. ✓
- To prevent over irrigation. ✓
- To prevent under irrigation.
- To prevent unnecessary crop stress.
- Prevent soil compaction.
- Save on energy costs.
- Create ideal air/water balance in soil. (Any 2) (2)

6.1.2
- Tensiometer.✓
- Class A evaporation pan.✓ (2)
- Moisture probe

6.2 6.2.1
- Brush drain. ✓
- Pole/pipe drain. ✓
- Stone drain. ✓
- Mole drain. ✓ (4)

6.2.2
- For correct calibrating of the sprayers. ✓
- Effective scheduling of irrigation. ✓
- To prevent over-utilisation of water sources. (Any 2) (2)

6.2.3 Flow rate = $\frac{\text{Content}}{\text{Time}}$ OR 1000✓✓ litres per hour✓✓

$= \frac{8\ 000}{8}$✓✓

= 1 000✓ litres per hour✓ (4)

6.3 6.3.1
- Sewage is broken down by anaerobic bacteria in the first tank. ✓
- Very little solids remain when the watery sewerage flows to the second tank. ✓
- Only liquid sewage remains and drains away through the outlet pipe or stone trench. ✓ (3)

6.3.2
- It can back up.✓
- Clog the drainage field. ✓ (2)

6.3.3
- Use only toilet paper. ✓
- No plastics or non-degradable materials. ✓
- No cigarette buts, rags etc. should get into the tank. ✓
- No disinfectants should be used. ✓
- No bleaches and oils. ✓ (5)

6.3.4
- Do not build near boreholes, drinking water installations. ✓
- Not next to the house. ✓
- Not near traffic.✓
- Not near where people eat, wash or work regularly. ✓ (4)

6.4
- Bury deep enough not to be damaged by implements. ✓
- Bury in sand. ✓
- Couplings must be firm and watertight. ✓
- A layer of lime should cover the pipeline about 600 mm above the pipe to prevent damaging the pipe at a later stage. (Any 2)

(2)
[30]

TOTAL SECTION B: 160
GRAND TOTAL: 200

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