These marking guidelines consist of 15 pages.
## SECTION A

### QUESTION 1

1.1 1.1.1 C ✓ ✓ (2)
1.1.2 A ✓ ✓ (2)
1.1.3 C ✓ ✓ (2)
1.1.4 C ✓ ✓ (2)
1.1.5 B ✓ ✓ (2)
1.1.6 C ✓ ✓ (2)
1.1.7 B ✓ ✓ (2)
1.1.8 A ✓ ✓ (2)
1.1.9 C ✓ ✓ (2)
1.1.10 A ✓ ✓ (2)

(10 x 2) (20)

1.2 1.2.1 cell phones ✓ ✓ (2)
1.2.2 flat belt ✓ ✓ (2)
1.2.3 methanol ✓ ✓ (2)
1.2.4 weaker ✓ ✓ (2)
1.2.5 Carbon-dioxide (CO₂)/dry powder ✓ ✓ (2)

(5 x 2) (10)

1.3 1.3.1 B ✓ ✓ (2)
1.3.2 E ✓ ✓ (2)
1.3.3 A ✓ ✓ (2)
1.3.4 D ✓ ✓ (2)
1.3.5 C ✓ ✓ (2)

(5 x 2) (10)

**TOTAL SECTION A: 40**
SECTION B

QUESTION 2: MATERIALS AND STRUCTURES

2.1 FOUR safety properties of insulation material

- Must not be harmful or dangerous to people when inhaled or touched.✓
- Should not burn easily. ✓
- Rodents and insects must not be able to eat it or build their nests in it (treated with an anti pest agent).✓
- Should be light.✓

(4)

2.2 TWO measures of ensuring that humans do not accidently come into contact with an electric fence.

- Place safety signs on the fence and gates.✓
- Don’t erect near or across pathways.✓

(2)

2.2.2 Reasons for using ceramic insulators between the wire and the post of an electric fence.

- It is not a conductor of electricity.✓
- Weather resistance/Strong/Durable.✓

(2)

2.2.3 Function of the appliances shown in the picture.

- It applies tension on the wire of an electric fence.✓
- When the fence wire loses its tension it is not necessary to loosen the wire, it can be wind up with this appliance.✓

(2)

2.2.4 Description of what will happen to a person when he/she touches an electric fence if the amperage is too high.

The result of too high amperage will be that a person will sustain a lethal shock that can cause tissue damage ✓ or heart failure. ✓

(2)

2.2.5 TWO types of batteries that can be used as a power source for an electric fence energizer.

- 12v dry disposable battery ✓
- 12v wet rechargeable battery ✓

(2)
2.2.6 Factors that have an influence on the earth return cycle of an electric fence.

- There must be a return path through the ground and an earth spike back to the energizer in order to complete the loop.✓
- The animal is the missing link that completes the loop.✓
- Vegetation will also complete the loop causing the output voltage of the energizer to drop.✓
- Therefore it is very important to keep any growth on the line to a minimum to ensure the animal receives the maximum shock from the energizer.✓

2.2.7 THREE ways of increasing the earth efficiency for particularly poor earth conditions like very dry soil.

- Increasing the number of earth spikes.✓
- Run an earth return wire in parallel to the fence line and connecting it to earth spikes at regular intervals.✓
- Using copper plates in the ground.✓

2.3 FOUR uses of Teflon on a farm.

- Automobile wiper blades✓
- Carpet or fabric protector✓
- All-weather clothing✓
- Coating for eyeglass lenses✓
- Magazines for guns✓
- Teflon coated cooking pans✓
- Teflon tape for sealing fittings✓
(Any 4)
- Car wash products✓
- O-Rings✓
- Oil and water seals✓
- Teflon Taps and fitting✓
- Non-return valves✓
- Flanges✓
- Pipe saddles✓

2.4 THREE different applications of Vesconite on farm implements.

- Bushes✓
- Solid rods✓
- Wear plates✓

2.5 Bronze used to manufacture propellers of huge ships.

- Ships spend all their life in seawater that is highly corrodible.✓
- Bronze is the most cost effective metal because of its resistance against corrosion by seawater.✓
2.6 FIVE influences that manganese have on stainless steel.

- It combats corrosion.
- Gives steel a coarser structure.
- Changes the band structure, at the same time causing a reduction in striking strength.
- Increases tensile strength.
- Reduces the critical cooling tempo and by doing so improves hardening.
- Increases resistance against wear.
- Reduces magnetism.

(Any 5)  \( (5) \)  

\[ [35] \]
QUESTION 3: ENERGY

3.1  3.1.1 FIVE different types of renewable energy sources used by modern society.

- Solar energy✓
- Wind energy✓
- Hydro energy✓
- Geothermal energy✓
- Bio energy✓
- Tidal energy✓
(Any 5) (5)

3.1.2 The geothermal source protection from cooling down too much.

Do not pump too much cold water into the hole✓ (1)

3.2  3.2.1 Factors that have a negative influence on the effectiveness of a solar energy cell.

- Climate, weather patterns✓
- High levels of pollution✓
- Sun energy is not available during the night time✓
- A cloudy day makes this energy source ineffective✓ (4)

3.2.2 TWO types of energy that are directly generated from solar energy.

- Heat✓
- Electricity✓ (2)

3.2.3 A device used with solar panels that change direct current to alternating current.

Inverter✓/transformer✓ (Any 1) (1)

3.3  3.3.1 TWO actions to prevent the blades from being damaged when they turns too fast during a strong wind storm.

- Change the pitch of the blades✓
- Apply the brakes✓ (2)
3.3.2 **FIVE advantages of a small wind energy system to the farmer.**

- Decades of free electricity after initial-cost recovery.
- Increased property values.
- Reliable electricity.
- Relief from high and volatile prices of other forms of electricity.
- Personal energy independence.
- Ability to support clean energy and reduce global warming.

(Any 5)
QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

4.1 4.1.1 THREE of the most possible causes of poor penetration during MIG welding.

- Current too low ✓
- Preparation too narrow ✓
- Root face too large ✓
- Root gap too small ✓
- Worn contact tip causing irregular arc ✓
- Incorrect alignment of plates ✓
(Any 3) (3)

4.1.2 Reason why it is not necessary to use additional flux when MIG welding.

The shielding gas (CO₂) replaces the flux ✓ (1)

4.1.3 TWO reasons why MIG welding is quicker than conventional arc welding.

- Rod is not changed regularly ✓
- Flux does not have to be removed ✓ (2)

4.1.4 Type of material used for manufacturing suitable protective clothing for welding.

Cotton ✓ (1)

4.1.5 A reason for your answer in QUESTION 4.1.4

Other synthetic materials melt when exposed to heat/cotton does not melt when exposed to heat ✓ (1)

4.1.6 Explanation of why a little metal ball occurs on the tip of your MIG welding torch.

- The gap between the welding tip and the work piece is too small ✓
- You are building up too much heat because the current setting is too high ✓ (2)

4.1.7 TWO ways of clearing the metal ball from the tip of the MIG welding torch.

- Use pliers to remove the blob of welding from the nozzle ✓
- Use a file or small grinder to remove the blob ✓
- In severe cases, replace the nozzle ✓ (Any 2) (2)
4.1.8 **TWO** different metals that can successfully be welded with a MIG welding machine.

- High alloy steel (stainless alloys)
- Aluminium
- Mild steel

(Any 2)

4.2 **Explanation on how you will achieve a neat final welded joint with the angle grinder.**

- Use a grinding wheel on the angle grinder.
- Be careful as you approach the surface of the original stock. You don’t want to grind through your nice new weld.
- Move the angle grinder around like you would a sander so as not to heat up, or grind away any one spot of the metal too much.
- If you see the metal get a blue colour to it you are either pushing too hard with the grinder or not moving the grinding wheel around enough.
- Wear a full face mask when grinding, a mask or respirator, and ear protection.

(Any 2)

4.3 **The overhead arc welding procedure.**

- Use an arc as short as possible.
- Weld a number of runs without any lateral movement.
- When molten metal starts dripping, the amperage should be reduced slightly.
- Move electrode slightly faster.
- Hold electrode in same position as in relation to base metal.

(Any 4)

4.4 4.4.1 **A device that can be used to light the flame of an oxy-acetylene torch.**

Always light the oxyacetylene torch with the striker.

4.4.2 **Explanation of why it is NOT advisable to use a cigarette lighter or matches when igniting the oxyacetylene torch.**

A cigarette lighter or match would put your hand too close to the ignition tip.
4.4.3 The procedure that must be followed to shut down the oxy-acetylene equipment after welding is finished.

- Turn off the acetylene valve on the torch handle.
- Turn off the oxygen valve on the torch handle.
- Turn the main cylinder valve clockwise on the top of both gas cylinders.
- Now open the two valves on the torch handle to 'bleed' the system.
- Turn both the oxygen and acetylene regulator handles counterclockwise until they are loose.
- Close both valves on the torch handle.

(Any 5) (5)

4.5 Explanation of how to deal with hazardous gasses when using a plasma cutting torch.

- Under no circumstances inhale these gases.
- If you must inspect a piece as you cut it, view the piece from the side, not from above. This will minimize your exposure to hazardous gas.
- Make sure the work area is well-ventilated as well.
- An exhaust hood or a space open to the outside is recommended when using a plasma torch.
- Respirators or other breathing apparatus may be required.

(5) [35]
QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

5.1  5.1.1 Identify component A.

Auger✓

(1)

5.1.2 The function of the ram.

The hay is compressed in the baling chamber by the ram✓ with a forward backward movement.✓

(2)

5.1.3 TWO functions of the slip clutch found in the drive mechanism of a baling machine.

• To prevent heavy objects from being taken into the baler.✓
• To protect the pick-up if it is impeded by anything.✓
• To protect the auger if it becomes overloaded.✓

(Any 2)

(2)

5.1.4 FIVE procedures that must be followed before the baler is stored for a long period.

• Remove all bales from baling chamber.✓
• Clean the baler properly.✓
• Drain and replace all oil.✓
• Releases the tension on all drive belts.✓
• Remove all chains, clean and oil them, and replace them.✓
• Dismantle all slip clutches, clean them and reassemble them but do not put the springs under tension.✓
• Totally reduce bale chamber tension.✓
• Cover all unpainted areas with a thin layer of grease.✓
• Grease all grease nipples.✓
• Store baler in a dry place under cover.✓

(Any 5)

(5)

5.2 Reason why it is necessary to make use of a four-wheel drive tractor with a front-end loader mechanism, to move large round bales.

The front suspension and wheels are stronger to carry the weight of the bales.✓

(1)

5.3  5.3.1 Calculation of the diameter of pulley A on the pump.

Na x Da = Ng x Dg

Diameter of Driven pulley  \( Dg = \frac{3.750 \times 200}{2000} \) ✓

\[ Dg = 375 \text{ mm} \] ✓

(4)
5.3.2 **FOUR advantages of V-belts.**

- V-belts do not easily slip off pulleys.✓
- V-belts draw tighter round pulleys when tension increases.✓
- Lubrication is never necessary.✓
- V-belts are relatively strong, and under normal circumstances do not easily break.✓
- Cold, moist conditions, age or use do not cause V-belts to stretch or shrink.✓
- V-belts last longer than flat belts.✓

(Any 4) (4)

5.4  

5.4.1 **Meaning of illustration of arrow A.**

The illustration shows how the plough✓ tends to push down the front wheels✓ when a top link✓ is fitted between the plough and tractor. (3)

5.4.2 **THREE ways a farmer could make use of to change a tractor’s mass displacement positively.**

- Decrease the tow bar pulling force✓
- Lower the tow bar✓
- Increase the wheelbase✓

(3)

5.4.3 **THREE factors that have an influence on the forward movement of the tractor when ploughing.**

- Ploughing depth✓
- Soil resistance✓
- Forward speed of the tractor✓

(3)

5.5  **The reason why a differential is installed in the rear axle of a tractor.**

- Changing direction of rotation✓
- Speed reduction✓
- Dividing rotation equal between the rear wheels✓
- Increase torque✓

(Any 3) (3)

5.6  **FOUR causes of tractor that overturns.**

- Cornering at high speed✓
- Driving off the shoulder of roads✓
- Working on a steep ditch, hill or washout✓
- Carrying loads too high in the front-end loader ✓
- Hitching too high when pulling heavy loads✓
- Towing loads downhill too fast and/or without sufficient brakes✓
- Sliding off loading ramps✓
- The load on the trailer more than 75% of the tractors weight✓

(Any 4) (4)
5.7 **TWO places where the sensitivity element can be installed on a tractor.**

- Where the top link is fitted ✓
- In the differential housing ✓
- At the base of the lifting arms ✓
(Any 2)  

\( (2) \)

5.8 **The medium that is used to drive each tool.**

A  Air ✓
B  Oil ✓
C  Electricity ✓

\( (3) \)

[40]
QUESTION 6: WATER MANAGEMENT

6.1 FOUR types of filtering systems used to purify water for human consumption and describe the working of each.

- Distillers’ purification system
  - They work with a boiling water/evaporation system.
- Reverse Osmoses purification system
  - It works through a liquid system and through a membrane very slowly in molecule level.
- Whole house purification system
  - Use cartridges to filter water.
- Faucet water filters
  - Installed in the kitchen and cleaned water as needed.
- Jug /Pitcher filters
  - The water will go in at the top and slowly filter down and finally captured at the bottom in a reservoir.

(Any 4 x 2)  (8)

6.2 Meaning of abbreviation 'GIS' and the use of it in a modern farming enterprise.

- GIS : Geographical Information System
  - Remote sensing image data from the soil and crops is processed and then added to the GIS database.
  - This data is analysed and interpreted.
  - Problem areas or areas of under production in fields are identified.
  - The problem areas can then be rectified by adding extra water or fertilizers.

(5)

6.3 Reasons for determining the flow rate of water in an irrigation system.

- To ensure the correct calibration of the sprayers.
- Effective scheduling of irrigation.
- To prevent the over utilization of the water source.
- To use water economically.

(Any 2)  (2)

6.4 6.4.1 The most important substance that is found in any septic drain that ensures that it will function properly.

Bacteria  (1)
6.4.2 The function of the distribution box of a septic drain.

- Serves to distribute the flow from the septic tank overflow evenly to the absorption field or seepage pits.
- It is important that each trench or pit receive an equal amount of flow.
- This prevents overloading of one part of the system. (3)

6.4.3 THREE places where a septic drain should not be build.

- Near boreholes or drinking water installations.
- Near the farmhouse.
- Near traffic.
- Where people usually eat, wash or work regularly. (Any 3) (3)

6.5 6.5.1 The use of the irrigation timer.

- This device controls the watering through different irrigation lines.
- This device can start and stop the irrigation system. (2)

6.5.2 TWO basic types of irrigation timers that can be used on a farm.

- Mechanical timers
- Electronic timers (2)

6.5.3 FOUR different types of irrigation systems.

- Overhead irrigation systems
- Centre pivot irrigation systems
- Sprinkler irrigation
- Travel irrigation system
- Wheel line irrigation system (Any 4) (4)

TOTAL SECTION B: 160
GRAND TOTAL: 200