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**SENIOR CERTIFICATE/
NATIONAL SENIOR CERTIFICATE**

GRADE 12

AGRICULTURAL TECHNOLOGY

NOVEMBER 2020

MARKING GUIDELINES

MARKS: 200

These marking guidelines consist of 16 pages.

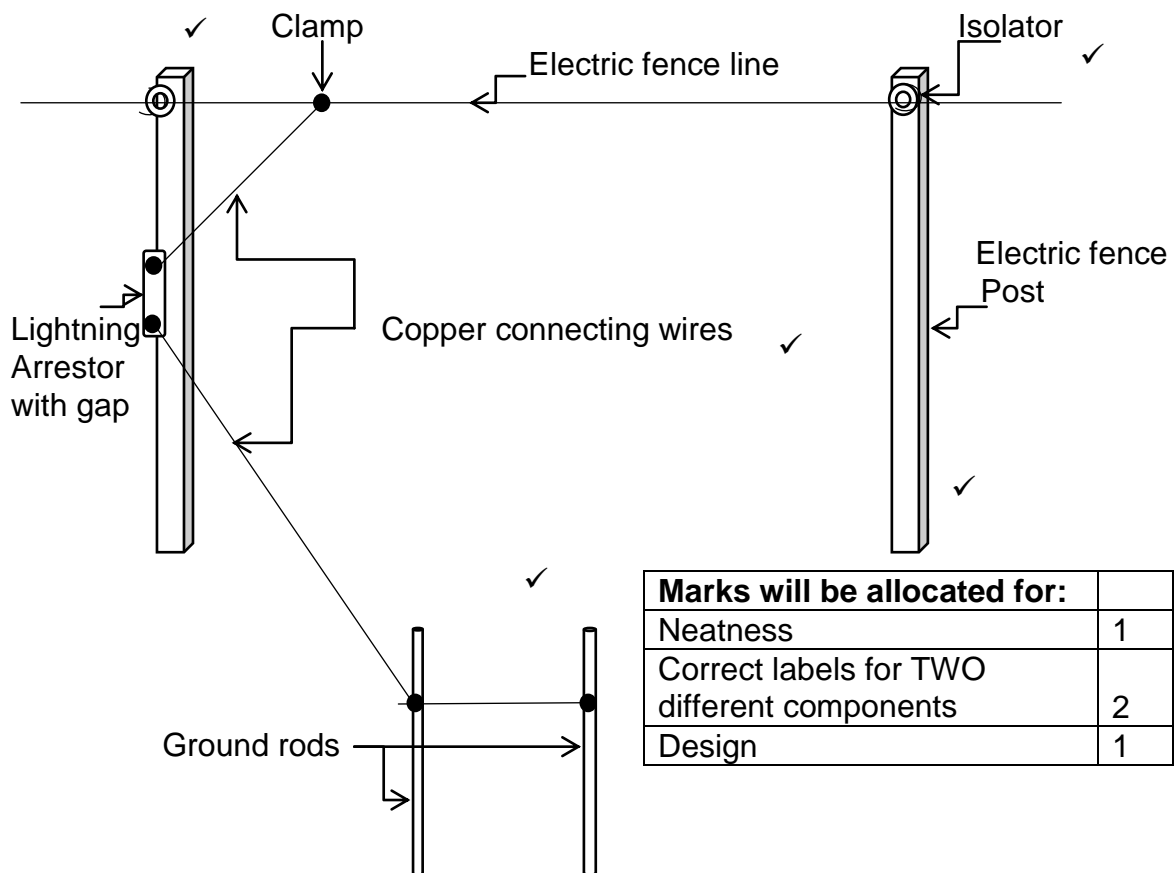
SECTION A**QUESTION 1**

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	B✓✓		(2)
	1.1.7	C✓✓		(2)
	1.1.8	C✓✓		(2)
	1.1.9	C✓✓		(2)
	1.1.10	A✓✓		(2)
			(10 x 2)	[20]
1.2	1.2.1	Manganese✓✓		(2)
	1.2.2	Copper✓✓		(2)
	1.2.3	Insulators/isolators/bobbin✓✓		(2)
	1.2.4	Zinc✓✓		(2)
	1.2.5	Spot/Arc/Mig/TIG welding✓✓		(2)
			(5 x 2)	(10)
1.3	1.3.1	D✓✓		(2)
	1.3.2	G✓✓		(2)
	1.3.3	F✓✓		(2)
	1.3.4	E✓✓		(2)
	1.3.5	B✓✓		(2)
			(5 x 2)	(10)
TOTAL SECTION A:				40

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

- 2.1 2.1.1 **Copper's suitability for the manufacturing of electrical cables.**
- It is a good conductor of heat.✓
 - Easily joined. (Soldering/Crimping)✓
 - Does not rust.✓
 - Lightness.✓
 - Durability.✓
 - It is a good conductor of Electricity.✓
 - Lightweight.✓
 - Easily manufactured. (Malleability)✓
- (Any 2) (2)
- 2.1.2 **THREE safety requirements that must be considered when installing the electric cables and leads of electric fences.**
- Connecting leads that are run inside buildings shall be effectively insulated from the earth structural parts of the building.✓
 - Connecting leads that are run underground shall be run in a conduit of insulating material/Well insulated.✓
 - Care shall be taken to avoid damage to the connecting leads due to the effects of animal hooves or tractor wheels sinking into the ground.✓
 - Connecting leads shall not be installed in the same conduit as the mains supply wiring, communication cables or data cables.✓
 - Connecting leads and electric fence wires shall not cross above overhead power or communication lines.✓
 - Cables buried deep enough so they cannot be damaged easily by implements.✓
 - A white beacon must indicate where cables are buried.
 - Switch of the power source or energizer.✓
 - Don't stand in water and work.✓
 - Wear the correct personal protective equipment/PPE.✓
- (Any 3) (3)

2.1.3 **Labelled drawing of a lightning arrester installed on an electric fence.**



(4)

2.2 **THREE influences that chromium has on stainless steel.**

- Increases resistance against corrosion. ✓
- Promotes the hardening of steel. ✓
- Improves strength. ✓
- Improves resistance to the formation of scale. ✓
- Improves tensile strength. ✓
- Decreases magnetism. ✓
- Most chromium steels can be welded well. ✓
- Give stainless steel a shiny appearance. ✓

(Any 3) (3)

2.3 2.3.1 **FOUR chemical substances that have no effect on Teflon coated surfaces.**

- Oil. ✓
- Grease. ✓
- Acids/Chemicals/Fertilizer/Paints. ✓
- Hydraulic fluids.
- Alcohol. ✓
- Cooling agents. ✓
- Hydrocarbons. ✓
- Solutions. ✓
- Fuels. ✓
- Gasses/CO₂. ✓

(Any 4) (4)

2.3.2 **TWO components that can be manufactured from Teflon.**

- Bushes.✓
- Cookware/cooking utensil coating.✓
- Electrical insulators.✓
- Valves/Taps/Gas seals.✓
- Fittings.✓
- Machine parts.✓
- Teflon tape.✓
- Vehicle window wipers. ✓
- Gun magazines.✓

(Any 2) (2)

2.4 **Explanation to the owner why it would be more profitable to manufacture and sell Vesconite bushes than steel bushes.**

- Long life.✓
- Lowest rate of wear.✓
- Can be used under dry and wet conditions.✓
- Keeps its size.✓
- Does not swell in water.✓
- Non-conductive to electricity.✓
- Not any lubrication needed.✓
- Easy to manufacture.✓
- Corrosion resistant.✓
- Does not delaminate.✓

(Any 3) (3)

2.5 **THREE adhesives a farmer can use to fix safety signs to the walls.**

- Silicon.✓
- Double-sided tape.✓
- No-more nails adhesive.✓
- Press stick.✓
- Epoxy.✓
- Latex.✓
- Bostic✓
- Glue gun.✓

(Any 3) (3)

2.6 **Description of the difference between cohesion and adhesion.**

- Cohesion – Inherent strength of the adhesive.✓
- Adhesion – Ability of the molecules of an adhesive to cling to the molecules of other substances.✓

(2)

2.7 2.7.1 **TWO materials that can be used as an insulator between the wire and the steel post of an electric fence.**

- Plastic.✓
- Glass.✓
- Teflon.✓
- Vesconite.✓
- Resin.✓
- Ceramic.✓
- Porcelain.✓

(Any 2) (2)

2.7.2 THREE requirements of electric fence warning boards.

- Firmly clamped to the fence wires at intervals recommended to be of approximately 10 metres to 50 metres, but not exceeding 90 metres.✓
- The warning signs shall be at least 100 mm x 200 mm.✓
- The background colour of both sides shall be yellow.✓
- The inscription shall be indelible/permanent, inscribed on both sides and have a height of at least 25 mm.
- Visible at eye height.✓

(Any 3)

(3)

2.8 FOUR safety requirements of insulation material in roofs.

- 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.✓
- Should be light.✓
- Non-conductive.✓

(Any 4)

(4)

[35]

QUESTION 3: ENERGY**3.1 FOUR main parts of the wind turbine.**

- Rotor.✓
- Gearbox.✓
- Generator.✓
- Blades.✓
- Main Shaft.✓
- Pillar/Column.
- Electrical wiring.✓
- Wind speed meter (anemometer).✓
- Brake system.✓
- Computer management system.✓
- Inverter.✓
- Electric motor.✓
- Transformer.✓

(Any 4) (4)

3.2 THREE factors that determine the efficiency of a solar electrical panel.

- The panel is not working to its full potential.✓
- When the electrons release heat; the panel also becomes warm, interfering with other aspects of the solar cells.✓
- Number of solar panels determines the efficiency of the system.✓
- Expensive technologies produce more electricity than cheaper ones.✓
- Location or direction of the sun rays.✓
- No objects blocking the sun's rays.✓
- Obviously nearer the equator you will receive a slightly better output with a given cell.✓
- Cleanliness of the panel.✓
- Weather conditions. ✓
- Season.✓

(Any 3) (3)

3.3 3.3.1 Procedure to produce geothermal energy.

- Deep holes are drilled into the earth until a significant geothermal hot spot is found.✓
- A pipe is placed deep inside the hole which allows hot steam to rise to the surface.✓
- The pressurized steam is then channelled into a turbine which begins to turn under the large force of the steam.✓
- This turbine is linked to the generator and so the generator also begins to turn, generating electricity.✓
- The cooled water is pumped down another pipe which is again heated and the process is repeated.✓

(Any 3) (3)

3.3.2 TWO problems associated with geothermal energy.

- You must not pump too much cold water into the earth.✓
- Geothermal power plants must be careful of escaping gases from deep within the earth.✓
- Geothermal hotspots are limited.✓
- It is expensive to locate the heat source.✓
- Availability of water. ✓

(Any 2) (2)

3.4 FOUR disadvantages of bio-fuel.

- Low energy output of the fuels.✓
- The production cost of the fuel is very high.✓
- Maize is needed to manufacture the fuel. Can lead to an imbalance in food products.✓
- Can lead to water shortage.✓
- Loss of habitats for animals and wild plants.✓
- If bio-fuel becomes profitable for farmers, they may grow crops for bio-fuel production instead of food production.✓
- Fewer food can lead to an increase in food prices and inflation.✓
- High initial setup cost.✓
- Not readily available.✓

(Any 4) (4)

3.5 FOUR advantages of the warm water solar geyser.

- Heat energy is limitless.✓
- Heat from the sun is completely clean.✓
- Heat panels are portable.✓
- Lower electricity bills.✓
- Reduce pollution.✓
- Saves energy.✓
- Lower maintenance costs.✓

(Any 4) (4)
[20]

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

- 4.1 4.1.1 **Names of parts A and B.**
A – Gas shroud/Cup/Cover.✓
B – Welding electrode/wire.✓ (2)
- 4.1.2 **The function of the part A.**
• Protects the contact tip.✓
• Directs the flow of gas out of the tip of the torch.✓ (2)
- 4.1.3 **Material used to manufacture part B.**
Steel (ferrous metals).✓ (1)
- 4.1.4 **The causes of the small weld balls on welding surface.**
• Gas is closed or used up.✓
• Dirty metal. (Paint/Oil/Grease)✓
• Rusted plate.✓
• Too little shielding gas.✓
• Too high amperage/current/flame. ✓
• Not applying anti-spatter. ✓
• Gas flow too low.✓
• Gases contaminate welding bead. (CO₂)✓ (Any 2) (2)
- 4.2 4.2.1 **Explanation of how a farmer would perform a vertical weld on two pieces of metal.**
(Any type of welding process is acceptable: Gas, MIG, TIG, Arc)
• Tack the prepared work pieces together.✓
• Special electrodes are used for vertical up welding with an arc welding machine.
• Amperage can be lowered slightly.✓
• Start at the bottom and move upwards. ✓
• Point of the electrode must face upwards at an angle of 30 °.✓
• Arc must be short and the speed must be just sufficient so that the melted puddle don't run down.✓
• Little sideward movement.✓ (Any 5) (5)
- 4.2.2 **The types of welding runs/patterns that can used for welding. (Drawings acceptable)**
• Zigzag.✓
• U-shape.✓
• Figure-8 shape.✓
• Triangular shape.✓
• Circular movement.✓ (Any 2) (2)

- 4.3 4.3.1 **Determination of the volume of the hole.**
 Volume of hole = 300 mm x 300 mm x 600 mm ✓
 = 54 000 000 mm³ – 4 700 000 mm³ ✓
 = 49 300 000 ✓ mm³ ✓
OR
 = 0.3 m x 0.3 m x 0.6 m ✓
 = 0.054 m³ – 0.0047 m³ ✓
 = 0.0493 ✓ m³ ✓ (4)
- 4.3.2 **Calculation of the volume of concrete that must be ordered.**
 49 300 000 mm³ x 4 ✓ = 197 200 000 ✓ mm³. ✓
OR
 0.0493 m³ x 4 ✓ = 0.1972 ✓ m³ ✓ (3)
- 4.4 4.4.1 **Identification of the type of shrinking that occurs at point A.**
 Lateral shrinking. ✓ (1)
- 4.4.2 **TWO ways of controlling distortion.**
 - Pre-setting. ✓
 - Welding of patch work. ✓
 - Clamping. ✓
 - Spot welding. ✓
 - Pre-heating. ✓ (Any 2) (2)
- 4.5 4.5.1 **The function of the two gauges labelled A and B.**
 A - Indicates the working/gas pressure at the torch. ✓
 B - Indicate the gas volume/pressure in the cylinder. ✓ (2)
- 4.5.2 **Description of the oxy-acetylene cutting process.**
 - Lighting process. ✓
 - First bring the material up to red hot. ✓
 - Lighting process. ✓
 - Oxygen is then fed with the lever on the cutting attachment. ✓
 - The steel actually ignites giving off more heat to keep the process going. ✓
 - The steel turns into a liquid. ✓
 - The iron liquid is cleared from the cut by pressure from the oxygen stream. ✓ (Any 4 in correct order) (4)
- 4.6 4.6.1 **Type of metal that can be cut with plasma.**
A reason for the answer.
 - High carbon steel/ Mild steel. ✓
 - Faster cutting tempo/rate/temperature at the best quality. ✓ (2)

- 4.6.2 **The cause if the plasma machine sometimes starts cutting but loses the arc and a resolve for this.**
- Damaged contact tip.✓
 - The contact tip needs to be replaced.✓
- OR**
- Presence of moisture in the system.✓
 - Install a water trap in the system.✓
- OR**
- Gap between the contact point and workpiece to big.✓
 - Reduce the gap between the contact tip and workpiece.✓
- OR**
- Dirt on workpiece.✓
 - Clean workpiece.✓
- OR**
- Earth clamp not making contact with the workpiece.✓
 - Re-attach earth clamp.✓
- (Any 2) (2)
- 4.6.3 **The material used to manufacture the standard plasma cutting electrode.**
- Tungsten/Copper.✓ (Any 1) (1)
- [35]**

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

5.1 Description of how you will maintain the implement below.

- Lubricate regularly.✓
- Sharpen all blades.✓
- See that all screens are in working order and in place.✓
- Remove foreign objects.✓
- Repaint damaged surfaces.✓
- Repair damaged or broken parts immediately.✓
- Store away from direct sunlight and rain.✓
- Check for vibration on machine.✓
- Clean the implement.✓
- Inspect chains.✓

(Any 4) (4)

5.2 5.2.1 Comparison of the two baling machines under the given headings in table form.

	Baler A	Baler B
Transporting of bales	Difficult to transport.✓ Smaller loads.✓ Takes more space.✓ (Any 1)	Easy to transport.✓ Larger loads.✓ Optimised space.✓ (Any 1)
Silage wrapping	Can wrap.✓	Cannot wrap./ Can wrap✓
Handling (Bale/Machine)	Mechanical.✓	By hand.✓

(6)

5.2.2 How bale density is changed in baler B.

By increasing or decreasing✓ the resistance to the hay in the baling chamber.✓

(2)

5.2.3 Discussion of the function of the slip clutch in the baler B.

- Its function is to prevent damage to the drive mechanisms✓ of the baler in case of an obstruction.✓

(2)

5.3 THREE safety measures when working with the silage cutter.

- Only the driver on the machine.✓
- Make sure that all safety screens are in place and in working order.✓
- Do not let people or animals come near the blades or working parts of the machine while working.✓
- Beware of overhead power lines.✓
- Look out for obstructive objects in the field.✓
- Study the operator’s manual.

(Any 3) (3)

5.4 FIVE problems that can occur when harvesting wheat with the harvester.

- Loss of grain due to blowers that are set incorrectly.✓
- Thresher that breaks the grain.✓
- Too much foreign particles.✓
- Mechanical problems.✓
- Cannot harvest when wheat is wet.✓

(5)

- 5.5 5.5.1 **Description of how the double-action hydraulic cylinder works.**
- When the control lever is in neutral position, the oil is pumped to the control valve and back to the oil container via the oil filter.✓
 - When the control lever is shifted to the lift position, the control valve directs the pressurized oil to the piston end of the hydraulic cylinder causing the piston to move to the right, and the implement is lifted.✓
 - In order to force the implement into the soil, the operator moves the control lever to the 'lower' position and now the control valve will direct the pressurized oil along the second pipe into the shaft-end of the cylinder causing the piston to move to the left.✓
 - In this way the operator controls the implement positively in two directions.✓ (4)
- 5.5.2 **Motivation of which side of the double-action hydraulic cylinder is the strongest.**
The thrust direction is stronger than the pull direction✓ because of the area that is subjected to the oil pressure in the cylinder.✓ (2)
- 5.6 5.6.1 **THREE ways to positively change a tractor's mass displacement.**
- Decrease the tow bar pulling force.✓
 - Lower the tow bar.✓
 - Set the wheels wider apart.✓
 - Add weights.✓
 - Add water in the wheels.✓ (3)
- 5.6.2 **What happens when the top link between the tractor and plough is removed?**
- The back of the plough will lift up.✓
 - The nose of the tractor will lift up.✓
 - When lifting the plough, the back end will remain on the ground.✓ (2)
- 5.7 5.7.1 **Choose a tractor A or B that would be most suitable for mounting a front-end loader system. Motivate your answer.**
- Tractor A.✓
- Because it has the capability of all-wheel drive.✓
 - The front suspension and wheels can handle larger weights.✓
 - Strength/Power/Weight of tractor.✓
 - Newer model of tractor.✓ (Any 2)
- OR**
- Tractor B.✓ (1)
- It is lighter on fuel.✓
 - More compact.✓
 - Less complicated.✓
 - Better sight.✓
 - Not expensive.✓
 - Much safer.✓ (Any 2) (2)

5.7.2 Why V-belts are preferred over flat belts.

- V-belts do not easily slip off pulleys.✓
- V-belts draw tighter round pulleys when speed increases.✓
- Lubrication is never necessary.✓
- V-belts are relatively strong.✓
- V-belts don't stretch or shrink.✓
- V-belts last longer than flat belts.✓

(Any 3) (3)

5.7.3 Why the exhaust pipe of tractor is longer than the air intake pipe.

- So that the exhaust fumes/smoke does not enter into the engine intake.✓
- So that the smoke from the exhaust pipe does not affect the driver/operator.✓

(Any 1) (1)
[40]

QUESTION 6: WATER MANAGEMENT

- 6.1 6.1.1 **TWO drive methods for the irrigation system to drive the wheels.**
• Mechanical.✓
• Electrical.✓
• Hydraulic.(Hydrostatic)✓ (Any 2) (2)
- 6.1.2 **A way of protecting the metal parts of the irrigation system against corrosion.**
Galvanizing.✓ (1)
- 6.1.3 **A reason for keeping the water pressure constant from the centre to the end of the centre pivot.**
So that the quantity of water that is administered to the crop is equal✓ from the centre of the land to the outer edge.✓ (Equal distribution of water) (2)
- 6.1.4 **A device that a farmer can install to automatically turn the system on or off as required.**
Irrigation timer/regulator.✓
Mobile phone.✓
Computer.✓ (Any 1) (1)
- 6.2 **THREE reasons for the use of water scheduling.**
• To save water.✓
• To prevent over irrigation.✓
• To prevent under irrigation.✓
• Crop variety.✓
• Water requirement per crop.✓
• Safe money on electricity/Night time irrigation is cheaper on electricity.✓ (Any 3) (3)
- 6.3 **TWO types of equipment that can be used effectively measure crop evapotranspiration.**
• Tensiometer/Neutron Moisture Probe (Thermal and satellite imaging)✓
• Evaporation pan.✓ (2)
- 6.4 6.4.1 **Label the diagram from A–E.**
A – Inlet pipe.✓
B – Scum/Foam.✓
C – Sewage water/Liquid.✓
D – Sludge/Solid waste.✓
E – Outlet pipe.✓ (5)
- 6.4.2 **Description of the main function of the bacteria that are present in the system.**
To break down the solid materials.✓ (1)

- 6.4.3 **Precautionary measures that must be taken when a septic tank is to be built.**
- Not near boreholes or drinking water installations.✓
 - A suitable distance away from the house.✓
 - Not near traffic.✓
 - Not near where people eat, wash or work regularly.✓
 - Not inside flood area of a river.✓
 - Not uphill from settlements.✓
 - No leaks in system.✓
- (Any 4) (4)
- 6.5 **Identification of the water drainage system shown.**
Channel drain/furrow drain✓ (1)
- 6.6 **Explanation of how water is purified by reverse osmosis.**
- The water is sent through two different liquids separated by a permeable membrane.✓
 - The permeable membrane allows only water to pass through on a molecular level.✓
 - The water flows through the system, leaving all impurities behind.✓
- (3)
- 6.7 **TWO communication systems that can be used to monitor the grazing patterns of livestock.**
- GPS collar.✓
 - Video live-feed via Wi-Fi/CCTV/drones.✓
 - Drone Technology/Infrared images.✓
 - Satellite imaging.✓
- (Any 2) (2)
- 6.8 **Re-arrangement of the steps in the integration of data by a Geographic Information System in the correct order:**
- Install yield monitors and measuring devices on harvesting equipment.✓
 - The yield data from the monitor is recorded and stored at regular intervals.✓
 - Geographic Information System software takes the yield data and produces yield maps.✓
- (3)

TOTAL SECTION B: 160
GRAND TOTAL: 200