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SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

AGRICULTURAL TECHNOLOGY

2023

MARKING GUIDELINES

MARKS: 200

These marking guidelines consist of 12 pages.

SECTION A**QUESTION 1**

- 1.1 1.1.1 C✓✓
- 1.1.2 A✓✓
- 1.1.3 B✓✓
- 1.1.4 D✓✓
- 1.1.5 C✓✓
- 1.1.6 A✓✓
- 1.1.7 B✓✓
- 1.1.8 A✓✓
- 1.1.9 A✓✓
- 1.1.10 B✓✓ (20)
- 1.2 1.2.1 Rolling. ✓✓
- 1.2.2 Hard facing. ✓✓
- 1.2.3 Area/Surface. ✓✓
- 1.2.4 Reduces/Decreases. ✓✓
- 1.2.5 Packing arms. ✓✓ (10)
- 1.3 1.3.1 C✓✓
- 1.3.2 F✓✓
- 1.3.3 B✓✓
- 1.3.4 G✓✓
- 1.3.5 H✓✓

TOTAL SECTION A: (10)
40

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

- 2.1 2.1.1 THREE reasons why the machining of Vesconite holds no health risk for the person working with it.
- Does not contain any asbestos/hazardous fibres.✓
 - Does not contain any lead.✓
 - Does not give off any poisonous gases/smoke when machined.✓ (3)
- 2.1.2 TWO products that could be manufactured from Vesconite.
- Bushes.✓
 - Solid rods.✓
 - Wear plates.✓
 - Washers.✓ (Any 2) (2)
- 2.2 2.2.1 The colour of tin.
- Silvery-white.✓ (1)
- 2.2.2 THREE instances where Tin-alloys are commercially used.
- Soft solder.✓
 - Pewter.✓
 - Bronze.✓
 - Used as a coating for steel cans. ✓
 - Food containers.✓ (Any 3) (3)
- 2.3 How to reduce the magnetism property of stainless steel without affecting its tensile strength.
- Add chromium.✓
 - Manganese.✓ (Any 1) (1)
- 2.4 The process of relieving the internal stresses of brass.
- Use a low-temperature annealing process for 0.5 to 1 hours ✓at 250-300 °C, dependent on the project size.✓ (2)
- 2.5 TWO uses of phosphor bronze.
- Precision-grade bearings.✓
 - Springs.✓ (2)

- 2.6 2.6.1 FOUR household materials where Genkem contact adhesive can be used as an adhesive.
- Leather.✓
 - Glass.✓
 - Wood.✓
 - Fabrics.✓
 - Rubber.✓
 - Metal.✓
 - Plastics.✓
- (Any 4) (4)
- 2.6.2 FOUR ways to improve the strength of the joint when using a contact adhesive.
- Apply a thin base coat if the surface is very porous.✓
 - Apply only a thin layer of adhesive. Avoid thick layer of adhesive on a joint.✓
 - Apply adhesive to both surfaces.✓
 - Surface must be clean.✓
 - Make the surface rough.✓
 - Use the correct type of adhesive.✓
 - Wait 10 min until dry before joining.✓
 - Needs to be heated.✓
- (Any 4) (4)
- 2.7 2.7.1 A type of fence and the reason for using this fence.
- Temporary/movable electrical fence.✓
 - Used to hold/control/isolate animals for a short period.✓
- (2)
- 2.7.2 The function of the electric fence energizer.
- Convert the battery- or mains power into a high voltage pulse/shock ✓when the animal touches the fence. ✓
- (2)
- 2.7.3 The properties of the isolators that fix the wire of an electric fence to the posts.
- Not conduct electricity.✓
 - Water resistance.✓
 - Durable/long lasting.✓
 - Easily replaceable ✓
 - Easy to use.✓
- (Any 3) (3)
- 2.7.4 Consequences for the person touching an electric fence that has a higher amperage than prescribed by law.
- The result of too high amperage will be that a person will sustain a shock that can cause injury/tissue damage✓ or heart failure.✓
- (2)
- 2.8 Identify part **A** and **B** and the function of each.
- A** – Armoured wire.✓ Protects the cable against mechanical damage.✓
- B** – Isolation material.✓ Protects the inner cable against water/moist.✓
- (4)

[35]

QUESTION 3: ENERGY

- 3.1 3.1.1 The systems that is suitable to provide electricity for a water pump.
- A Mountains direct the wind in the wind turbine ✓✓
OR
 B Mountains block the wind ✓✓ (2)
- 3.1.2 THREE advantages of system **A** (wind) when compare to **B** (solar).
- Compact. ✓
 - Cheap. ✓
 - Easy to move. ✓
 - Low maintenance. ✓
 - Easy to install. ✓
 - Can operate when there is no sun. ✓
 - No need to be cleaned. ✓ (Any 3) (3)
- 3.2 THREE disadvantages of solar geysers
- Susceptible to corrosion and scaling. ✓
 - Very heavy. ✓
 - High maintenance. ✓
 - Expensive. ✓
 - No hot water on a cloudy day or during nighttime. ✓
 - Can overheat. ✓
 - Must be orientated correctly. ✓
 - Can be damaged by bad weather conditions. ✓ (Any 3) (3)
- 3.3 THREE problems associated with a coal power station.
- Pollution. ✓
 - Unreliable. ✓
 - High maintenance. ✓
 - Transport of coal is expensive. ✓
 - Rely on fossil fuels. ✓ (Any 3) (3)
- 3.4 The process of extracting geothermal energy to produce electricity.
- Deep holes drilled into the earth to find a geothermal hot spot. ✓
 - A pipe/sleeve is installed inside the hole. ✓
 - Cold water is pumped into the hole to be heated by the heat source. ✓
 - The pressurized steam rises up to the surface. ✓
 - The steam is channelled to a turbine that begins to turn. ✓
 - This turbine is connected to the generator that generates the electricity. ✓ (6)
- 3.5 THREE benefits of methanol when used as a supplement fuel for a vehicle.
- It offers lower exhaust emissions. ✓
 - Higher vehicle performance. ✓
 - It can easily be converted into hydrogen. ✓
 - Has a lower risk of flammability than petrol. ✓ (Any 3) (3)

[20]

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

- 4.1 4.1.1 Cutting of corroded metal where no electricity is available.
C✓ (1)
- 4.1.2 Small compact welding machine used to repair a farm gate in the field, using a small generator to produce electricity.
D✓ (1)
- 4.1.3 Precision cutting without the use of acetylene.
A✓ (1)
- 4.1.4 Welding machine without a welding rod.
B✓ (1)
- 4.1.5 Machine that does not require gas.
D✓ (1)
- 4.2 4.2.1 Correct order: 4,✓ 2,✓ 1,✓ 5,✓ 3,✓ (5)
- 4.2.2 Total cost of the angle iron used to complete the ramp.
Angle iron (32 mm x 32 mm): 2 000 mm + 2 000 mm + 500 mm = 4 500 mm (4,5 m) ✓
 $4,5 \text{ m} \times \text{R}95,00 = \text{R}427,50$ ✓
Angle iron: (25 mm x 25 mm) 9 x 400 mm = 3 600 mm (3,6 m) ✓
 $3,6 \text{ m} \times \text{R}43,00 = \text{R}154,80$ ✓
Total cost: $\text{R}427,50 + \text{R}154,80 = \text{R}582,30$ ✓
(Allow for different interpretations during the marking process) (5)
- 4.3 4.3.1 Identify the component.
Gas flow regulator. ✓ (1)

- 4.3.2 The importance of setting the component correctly before proceeding with the welding process.
- To prevent spatter. ✓
 - To ensure a constant weld. ✓
 - To shield the weld properly. ✓
 - Without the gas, your the welds will look brown, spattered and just generally not very nice. ✓
 - To prevent porosity. ✓
- (Any 4) (4)
- 4.3.3 Working pressure for the MIG welding process.
- Between 10 and 25 PSI. ✓ (1)
- 4.4 4.4.1 Description of the overhead arc welding technique.
- Use an arc as short as possible. ✓
 - Weld a number of runs without any lateral movement. ✓
 - When molten metal starts dripping, slightly reduce the amperage. ✓
 - Move electrode/gun slightly faster. ✓
 - Hold electrode/gun in same position as in relation to base metal. ✓
- (5)
- 4.4.2 Safety measure of overhead welding, with a reason.
- Operator use leather gloves/fire retardend overall/full face welding helmet/hard hat. ✓
 - To protect him from molten metal that drips from work piece and might cause serious damage to skin/ body. ✓
- (2)
- 4.5 4.5.1 THREE personal protective equipment that must be worn when performing a task with the oxyacetylene apparatus.
- Over all. ✓
 - Leather gloves. ✓
 - Leather apron. ✓
 - Safety boots/Fire resistant shoes. ✓
 - Leather spats. ✓
 - Oxy-acetylene welding goggles/helmet. ✓
- (Any 3) (3)
- 4.5.2 The gas cylinder that needs to be opened first, with a reason.
- Acetylene. ✓
 - Acetylene is the flammable gas. ✓
- (2)
- 4.5.3 Agree with this statement and motivate the answer.
- Yes. ✓ Gas usage will not be effective when the bottles are lying on its side because the gas will be turned into a liquid making it difficult to pass through the gas pipes. ✓
- (2)
- [35]**

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

- 5.1 5.1.1 FOUR mechanical problems that can be experienced with the cutting mechanism.
- Blunt/broken blades that cause a blockage.✓
 - Blunt/broken cutting rotor.✓
 - Seized bearings.✓
 - Worn belts and chains.✓
 - No lubrication.✓
 - Rust on the parts.✓
 - Obstructions in the mechanism.✓
- (Any 4) (4)
- 5.1.2 Choose between A and B. Motivate your answer.
- B✓ (1)
- Low initial purchasing cost.✓
 - Easy to maintain.✓
 - Efficient in small fields.✓
 - Lower maintenance cost.✓
 - Low running cost.✓
 - Not necessary for an extra tractor with a trailer.✓
- (Any 2) (3)
- 5.1.3 The procedures of preparing a machine before working with it.
- All grease points must be well greased.✓
 - The correct tension must be set for all belts and chains.✓
 - Check that all parts are functioning correctly by operating it slowly.✓
 - Replace all worn 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.✓
 - Check the tyre pressure.✓
 - Check the oil and water levels.✓
- (Any 5) (5)
- 5.2 5.2.1 Function of grease nipples.
- An external grease point to apply the grease for the universal. ✓ (1)
- 5.2.2 Function of component B.
- To keep the connected implement in the centre at the back of the tractor✓ or to stabilise the implement.✓ (Any 1) (1)
- 5.2.3 THREE requirements for screens.
- Strong✓
 - Not become loose✓
 - Weight saving✓
 - Must provide adequate/efficient protection.✓
 - Bright colour screens for clear visibility.✓
- (Any 3) (3)

- 5.3.1 FOUR factors to be considered before buying a new tractor that needs to be equipped with a front-end loader.
- 4x4.✓
 - Power steering.✓
 - Rigidity of construction.✓
 - Driver safety and comfort.✓
 - Driving power.✓
 - Connection points for front loader hydraulics.✓
 - Size of front tyres.✓
 - Lifting capacity of the front-end loader.✓
 - Broken/damaged parts.✓
- (Any 4) (4)
- 5.3.2 FOUR safety precautions when working with a front-end loader against a slope.
- Only operate the loader against the vertical angle of the slope.✓
 - Stay away from the outer edge when working along high banks and slopes.✓
 - Carry the load low to the ground and watch for obstructions on the ground.✓
 - Always use the recommended amount of counterweight to ensure good stability.✓
 - All tractors used to move bales should have rollover protective structures (ROPS).✓
 - Tractor operators should utilize the tractor seat belt at all times when operating the tractor, regardless of the task that is being done.✓
- (Any 4) (4)
- 5.4 5.4.1 Name part A.
- A - Pick-up mechanism/teeth/needles/fingers. ✓ (1)
- 5.4.2 Changing bale density on a ram-type baler.
- By increasing or decreasing the resistance✓ to the hay moving through the baling chamber.✓ (2)
- 5.4.3 The functions of the slip clutch on the ram-type baler.
- Prevent heavy objects from being taken into the baler.✓
 - Protect the pick-up if it is impeded by anything.✓
 - Protect the auger if it becomes overloaded.✓
- (3)

5.5 5.5.1 Reason why a differential is fitted on a tractor.

Differential is used to divide the rotation equal between the two rear wheels, ✓ change the direction of rotation ✓ and to affect speed reduction. ✓ (Any 2) (2)

5.5.2 Name parts A and B.

A - Driving shaft. ✓

B - Crown wheel gear. ✓ (2)

5.6 Complete the table:

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

- 5.6.1
- Diesel mixture too rich. ✓
 - Worn/faulty injectors. ✓

(Any 1) (1)

5.6.2 White smoke. ✓

(1)

- 5.6.3
- Engine uses oil. ✓
 - Piston rings are worn. ✓
 - Cylinder sleeves are worn. ✓
 - Valve stem seals are worn. ✓

(Any 1) (1)

5.7 5.7.1 Name of the tool.

Pneumatic/Air wrench/Drill with a drill attachment. ✓

(1)

5.7.2 Power source used.

Air/Compressor. ✓

(1)

[40]

QUESTION 6: WATER MANAGEMENT

- 6.1 6.1.1 Reasons why movable sprinkler irrigation systems is the most effective for using on small pieces of irrigation fields.
- Inexpensive to purchase.✓
 - Low maintenance cost.✓
 - Low running cost.✓
 - Low labour needs.✓
 - The reach of the system is more suitable for small fields because of the limited length of the pipe.✓ (Any 4) (4)
- 6.1.2 Working of the movable/drum/travelling irrigation system.
- The system makes use of polyethylene tubing coiled on a steel drum.✓
 - It is powered by irrigation water or a small engine .✓
 - The sprinkler is pulled across the field by its own cable system.✓
 - The system shuts down automatically when the sprinkler reaches the end of the line.✓
 - A large sprinkler attached to the systems applies water in a circular pattern.✓ (Any 4) (4)
- 6.2 6.2.1 Reason for connecting an irrigation sprinkler to a Variable Rate Applicator.
- To adapt the rate of water application to various needs as occurring in the irrigation field.✓ (1)
- 6.2.2 Reasons for the sprinklers positioned at a specific height above the crop.
- To limit evaporation.✓
 - To ensure effective distribution of the water.✓
 - To prevent the sprinkler from interference by the plants.✓ (Any 2) (2)
- 6.3 Explanation of the term irrigation scheduling.
- It is the process used by irrigation system managers✓ to determine the correct frequency/flow and duration of watering.✓ (2)
- 6.4 FOUR aspects that must be considered when choosing a suitable site for building a septic tank system.
- Must be installed a safe distance from houses, boreholes, traffic and drinking water installations, rivers, streams, underground aquifers.✓
 - A septic tank must be below ground level.✓
 - The drainage field must channel the wastewater away from houses.✓
 - Not installed uphill from the house.✓
 - Availing wind directions must be considered to accommodate odours or smells.✓ (Any 4) (4)

- 6.5 Identification of a drainage system.
- 6.5 6.5.1 To remove large amounts of rainwater from suburban areas.
Chanel drain.✓ (1)
- 6.5.2 To remove excess water from lawns.
Perforated pipes.✓
Drainage ditch.✓ (Any 1) (1)
- 6.6 Effective use of computer software in an irrigation system.
- Prevent over and under irrigation by regulating the water supply.✓
 - Remote operation capability.✓
 - Variable Rate Irrigation Sprinkler integration/adaptability/capability.✓
 - It controls the time, duration and tempo of water supply.✓
 - It receives inputs from different monitoring devices.✓
 - It receives information from different remote information sources.✓
 - Programmable.✓
 - Control liquid fertilizer application.✓ (Any 2) (2)
- 6.7 TWO devices that measure evapotranspiration in a field.
- Tensio-meter.✓
 - Evaporation pan/class-A pan.✓ (2)
- 6.8 TWO disadvantages of distillation as a water purifying method.
- Distillation cannot remove chemicals.✓
 - It is a time consuming method.✓
 - Energy consuming method.✓ (Any 2) (2)
- 6.9 Method of filtration of water with a jug filter system.
- Water is poured into the top of the jug.✓
 - The water works its way downward through the filtration medium.✓ (2)
- 6.10 THREE reasons for fitting farm machinery with a GPS.
- For precision agriculture.✓
 - To pinpoint location of machinery.✓
 - Necessary for autonomous machinery.✓
 - To apply VRT.✓
 - To measure speed for accurate application of fertilizer and chemicals. ✓ (Any 3) (3)

[30]

TOTAL SECTION B: 160
GRAND TOTAL: 200