AGRICULTURAL TECHNOLOGY

NOVEMBER 2011

POSSIBLE ANSWERS

MARKS: 200

This memorandum consists of 11 pages.
### SECTION A

#### QUESTION 1

<p>| | | | |</p>
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**TOTAL SECTION A:** 40
SECTION B

QUESTION 2: MATERIALS AND STRUCTURES

2.1 2.1.1 • Copper ✔
       • Lead ✔
       • Tin ✔
       • Aluminium
       • Zinc
       • Brass
       (Any 3)

2.1.2

<table>
<thead>
<tr>
<th>ALLOY</th>
<th>METALS</th>
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<tbody>
<tr>
<td>(a) Stainless steel</td>
<td>Manganese, ✔Chromium, ✔Nickel ✔</td>
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<tr>
<td>(b) Brass</td>
<td>Copper, ✔Tin ✔</td>
</tr>
<tr>
<td>(c) Solder</td>
<td>Lead ✔, Tin ✔</td>
</tr>
</tbody>
</table>

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

2.2.2 High temperatures ✔
Chemical reactions ✔
Corrosion
Stress cracking
(Any 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
• Do not get it in your eyes.
(Any 3)

2.3 2.3.1 600 x 230 mm ✔✔

2.3.2 Lintels act as support
over window ✔ and door openings ✔

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

2.4 2.4.1 Beam ✔

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. ✓

3.1.2 • 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.
• 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

3.2.2 The sun heats up the water in the solar panels, the heated water always rises 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. ✓

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.

3.4 3.4.1 woody plant fibre or natural gas. ✓

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

3.4.3 earth gas, landfills, kraal manure, rubbish dumps and swamps. ✓

(Any 1)
QUESTION 4:
SKILLS AND CONSTRUCTION PROCESSES

4.1

![Diagram of welding process]

Neatness: 1 Mark

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.

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

4.2.3 Argon, ✓
Helium ✓
Carbon dioxide (CO₂).

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. ✓

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

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

5.1.2 • Ploughing depth. 
• Soil resistance. 
• Forward speed of the tractor. 

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. 

5.2.2 • 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) 

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) 

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) 

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  • 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. ✓
      (Any acceptable answer) (4)

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. ✓
      • After sale service etc
      • Energy source available (Any 4) (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. ✓
    • Moisture probe  (2)

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 ✓  
= \[ \frac{8,000}{8} \] ✓ 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