This memorandum consists of 9 pages.
### SECTION A

**QUESTION 1**

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TOTAL SECTION A: (20 x 2) 40
SECTION B

QUESTION 2: MATERIALS AND STRUCTURES

2.1 • 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 (Any 5) (5)

2.2 • Extend in a straight line ✓
   • Sturdy corner and straining posts ✓
   • Posts upright ✓
   • Straining posts not far from one another ✓
   • Strands firmly attached to line posts by means of isolators ✓
   • Posts and wires should be spaced equally ✓
   • Do not make use of inferior material (7)

2.3 • Pressure should be high enough to satisfy needs ✓
   • Prevent spillage ✓
   • Joints should be watertight ✓
   • Removal of spillage water ✓
   • Protect all valves (Any 4) (4)

2.4 2.4.1 • Not a solid wood. (not strong enough) ✓
   • Deteriorates/disintegrate in moist conditions ✓ (2)
   2.4.2 • Triangular because of their specific shape/design ✓
   • Are very strong. ✓
   • It strengthens the construction so that the struts ✓
   • can carry the weight of the roof. ✓ (4)

2.5 2.5.1 (a) Stretcher bond ✓
   (b) English bond ✓ (2)
   2.5.2 • DPC prevents damp rising up into the walls, causes a big problem for painting and plastering at a later stage. ✓
   • Before you start the wall, unroll the 225mm DPC onto the brickwork of the foundation; ✓
   • with an overlap of ± 300mm. ✓
   • Always place DPC underneath all outside windowsills ✓
   • to prevent penetration of water into the wall. ✓ (5)
2.6  • Mild-steel sheets ✓
   • are cleaned ✓
   • with hydrochloric acid, ✓
   • then fluxed ✓
   • with zinc-chloride ✓
   • and dipped into molten zinc. ✓

QUESTION 3: ENERGY

3.1 3.1.1  • Solar cells or panels are necessary. ✓
   • The solar panels are made of a semi-conductive material – silicon. ✓
   • The semi-conductive material contains inactive electrons. ✓
   • When photons reach the solar cells, ✓
   • The electrons absorb this solar energy, ✓
   • Transforming them into conduction electrons.
   • The solar cells convert the electrons in the photons to free electrons.
   • Which can be conducted through the circuit to its destination
   • The stronger the sun shines, the more electricity is generated.
   • Electricity is then stored in a battery for later use. (Any 5) (5)

3.1.2  • That the cell is not working to its full potential (e.g. some electrons may be lost), ✓
   • When the electrons release heat; the panel also becomes warm, interfering with other aspects of the solar cells. ✓
   • The number of solar panels determines the efficiency of the system. ✓
   • Location of the panels ✓
   • Solar cells should always be facing the direction of the sun (north), and have no structures blocking the sun’s rays. ✓ (5)

3.1.3  • Easy to install ✓
   • Low maintenance costs ✓
   • Relative cheap energy ✓
   • Environmental friendly energy source (3)

3.2 3.2.1  • Biofuel is any plant or animal matter which can be combusted and used as a fuel. ✓
   • Biofuels are one of the new ranges of renewable energy sources in the world today. ✓ (2)

3.2.2  • Low energy output of the fuels. ✓
   • Production cost of the fuel is very high currently. ✓
   • Certain food crops like maize are needed to produce them, which may lead to an imbalance in food security. ✓
   • There is a huge quantity of water required which may affect the local water resources.
   • More land to produce crops for bio fuel. Habitats of animals and wild plants might be endangered. (Any 3) (3)
3.2.3 • Is an alternative fuel made from woody plant fibre, coal or natural gas ✓
• it is used primarily as a supplement to gasoline. ✓
• It can be harvested from the methane gas in landfills in addition to fermented waste products such as sewage and manure.
• Pure methanol can be used as a racing motor fuel
• It is also the primary alcohol used to mix with biodiesel. (Any 2) (2)

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

4.1 • Use a pure nickel-welding rod. ✓
• Amperage must be as low as possible. ✓
• Arc must be a little longer than when welding mild steel. ✓
• Make sure that all rust, grease, dirt and/or any other substances, which can weaken the joint has been removed, before starting with the process of joining. ✓
• Remember to remove the surface layer of the metal where the joint is to be made. ✓
• Cover the suspect area to be welded with white chalk. Vaseline in the cracks will colour the chalk grey or show a wet line. ✓
• Mark the line by means of a prick-punch and hammer to prevent the line from disappearing when grinding out the V-groove. ✓
• It is very important that the cast-iron to be welded is kept as cool as possible during the welding process. ✓
• Pre-heating of a cast-iron to be welded can help to prevent it from forming new cracks. ✓
• Cast-iron should be allowed to cool down slowly after welding. ✓
• A cast-iron should never be submerged in water to cool it down.
• The run can be lightly tapped with a small hammer while it is cooling down.
• This action helps to relieve the tension around the weld. (Any 10) (10)

4.2 • Requires a smaller melting pool, big enough to create the expected penetration. ✓
• Done by reducing the size of the flame. ✓
• Or using a slightly thicker welding rod. ✓
• Force of the flame will help to keep the molten metal positioned. ✓ (4)

4.3 4.3.1 A – Longitudinal shrinking ✓
B – Angular shrinking longitudinally ✓
C – Angular shrinking ✓
D – Lateral shrinking ✓ (4)

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 (Any 3) (3)
4.3.3 • Pre-setting ✓
• Welding of patch work ✓
• Clamping ✓
• Spot welding ✓

4.4 • Metal against metal friction ✓
• Serious jolts or shocks of metal against rock ✓
• Jolts and shocks ✓
• Serious scraping ✓

4.5 **Neatness 2 Marks ✓ ✓**

✓ Welding run
QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

5.1 5.1.1  
• Lubricate regularly ✓
• Sharpen all blades ✓
• See that all screens are in working order or in place ✓
• Replace worn V-belts ✓
• Make sure all V-belts are tight ✓
• Repair damaged or broken parts immediately ✓

(6)

5.1.2  
• Welger system ✓
• Vermeer system ✓

(2)

5.1.3  
• Slip clutch ✓
• Screens ✓
• Shear bolts ✓
• Ram-stop safety mechanism ✓

(4)

5.2 5.2.1  
• Very quick way of getting your crop from the land ✓
• Very reliable method of harvesting ✓
• Economical ✓
• Labour saving ✓
• Accurate record-keeping ✓
• Computers do the whole harvesting process with little input from the operator
• Single operation

(Any 5)

(5)

5.2.2  
• Loss of kernels may occur ✓
• The wrong drum speed may break the kernels ✓

(2)

5.3 5.3.1 Universal joint ✓

(1)

5.3.2  
• Strong ✓
• Must not become loose (secured) ✓
• Weight-saving ✓
• Must provide adequate/efficient protection ✓

(4)

5.4 5.4.1  
• Engine-oil levels ✓
• Gearbox-oil levels ✓
• Final drive-shaft oil levels ✓
• Leakages in cooling systems ✓
• Leakages in fuel systems ✓
• Leakages in hydraulic systems ✓
• Instruments
• Battery
• Tire pressure
• Fuel level

(Any 6)

(6)
5.4.2  
- Type of use ✓
- Maximum drive requirements ✓
- Texture of the soil ✓
- Type of tractor ✓

5.5  
- Single-action hydraulic cylinder ✓
- Double-action hydraulic cylinder ✓

5.6  
- To adjust the cross-angle of the implement ✓
- in relation to the tractor ✓

5.7  
- To adjust the angle of the implement ✓
- in relation to the tractor's movement ✓
QUESTION 6: WATER MANAGEMENT

6.1 6.1.1  • Open drains ✓  
      • Closed drains ✓  
(2)

6.1.2  • The bottom of the trench is loosely packed with large stones ✓  
      • It is then covered with smaller stones ✓  
      • Finally it is covered with gravel and soil ✓  
(3)

6.1.3  • Installation costs are very high ✓  
      • Blockages occur from time to time ✓  
      • and are expensive to correct ✓  
      • The installation requires technical skills and knowledge (Any 3)  
(3)

6.1.4 (a) Open drain  
(b) Stone drain  
(c) Septic tank  
(d) Fishbone drain  
(e) Sieve  
(5)

6.1.5  • Depends on the depth of the impervious subsoil layer and the soil texture ✓  
      • Sandy soil ✓ – stone may be placed from 1,0 m to 1,5 m deep ✓  
      • Clay soil ✓ – the stone are shallower and usually from 0,4 m to 1 m deep ✓  
(5)

6.1.6  • House sewer ✓  
      • Septic tank ✓  
      • Distribution box ✓  
      • Absorption field ✓  
(4)

6.2 6.2.1  • The sewage that seeps through the open bottom and portholes in the sides of the walls can cause clogging up with overuse ✓  
      • The introduction of detergents and other material slows the bacterial action ✓  
(2)

6.2.2  • Excessive quantities of detergents ✓  
      • Laundry waste ✓  
      • Bleach ✓  
      • Household chemicals ✓  
      • Caustic drain openers (Any 4)  
(4)

6.3  • Use only toilet paper ✓  
      • No plastics or non degradable plastics ✓  
      • No cigarette buds and rags  
      • No disinfectants should be used  
      • No bleaches and oils (Any 2)  
(2)

[30]

TOTAL SECTION B: 160  
GRAND TOTAL: 200