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

**QUESTION 1**

<p>| | | |</p>
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</tbody>
</table>

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

QUESTION 2: MATERIALS AND STRUCTURES

2.1

- Electroplating. ✓
- Painting Powder coating/Rubberizing. ✓
- Galvanising. ✓

(3)

2.2

- Heat resistance. (Temperature) ✓
  The adhesive itself should not distort, melt or burn when heated. ✓
- Water-resistance. ✓
  When placed in humid conditions, a water resistant adhesive should not
dissolve/weaken in the water. ✓
- Elasticity. ✓
  If we want to join elastic materials, we would use an adhesive, which
would still be elastic after it has become dry, e.g. Bostik and Prestik. ✓
- Load capacity. ✓
  The adhesive should be able to withstand tension. ✓
- Inflammability. ✓
  The adhesive itself must comply with the same properties where it is
subjected to open flames or heat. ✓
- Duration of cohesion/adhesion.
  The period of time that an adhesive will stick, after been applied to join
materials.
- Duration of usability.
  The catalyst and the accelerator can have an influence on the speed and
usability of the adhesive after being mixed. (Any 5)

(10)

2.3

- It connects the different roof trusses together and keeps the spaces
  correct/strengthening. ✓
- Hold trusses upright. ✓
- Roof and ceiling is fastened to it. (Nails or screws) ✓

(3)

2.4

Pink aerolite. (Any acceptable answer) ✓

(1)

2.5

2.5.1

Strengthening with reinforcement. ✓
  Reinforcement beams must be placed in a crisscross pattern
  in the cement foundation to prevent the shifting and cracking
  of the foundation. ✓
  Thickness of the foundation. ✓
  The thickness of the foundation must correlate with the
  weight of the structure. ✓

(Any 2)

(4)

2.5.2

- Make sure the size/measurements of the foundation are
correct. ✓
- The mixture of the cement in the foundation. ✓
- Drainage of exess water away from the foundation. ✓

(3)
2.6 2.6.1 For sun light/radiant energy penetration into room. ✓
2.6.2 Some game species can jump over the fence. ✓
2.6.3 The wire will shrink on a cold day and break. ✓
2.6.4 Half round forms will give a stronger structure against strong winds. ✓
2.6.5 Isolation keeps the water from freezing inside the pipes during winter preventing the pipes from bursting. ✓

2.7 • Roofs ✓
• Water troughs ✓
• Water buckets ✓
• Gutters ✓
• Housing (Any 4) (4)

2.8 • Keep concrete moist and covered for at least 7–10 days afterwards. ✓
• Paint with curing paint. ✓
**QUESTION 3: ENERGY**

### COLUMN A | COLUMN B
---|---
3.1.1 An alcohol biofuel used in racing cars | methanol
3.1.2 Gas from earth gas or landfills | methane
3.1.3 Fermenting and then distilling starch and sugar crops | ethanol
3.1.4 Made from crude oil | petroleum
3.1.5 Transesterification of fatty acids | biodiesel

3.2
- Damaged insulation material.
- Inadequate or faulty earth leakage protection.
- Open electric wires.
- Overloading of electric installations.
- Wrong connection of electric wires.
- Lack of knowledge. (Any relevant answer)

3.3
- You need to be able to capture energy from the force of the wind.
- through the use of a wind turbine with a propeller blade type design.
- The turbines are attached to a generator which enables the generator to produce electrical power.

3.4 Bio-fuel is any plant or animal matter (organic material/residues) that is combustible and used as a fuel.

3.5
- Cheaper solution to our energy needs/low cost.
- Biodegradable./Regenerate faster than conventional fuels.
- Are renewable sources of energy.
- Can help prevent engine knocking.
- Less pollution-environmental friendly
- Engines do not require any radical changes to switch to use these fuels.

(Any 3) [20]
QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

4.1 4.1.1 A Direction of travel. ✓
     B Electrode. ✓
     C Base metal/Work piece. ✓
     D Weld metal/bead. ✓
     E Gas shield. ✓

4.1.2 MIG = Metal ✓ Insert/Inert ✓ Gas. ✓

4.1.3 • High welding speed/Faster. ✓
• Important savings in materials and weight. ✓
• High mechanical properties of welding joints. ✓
• Neat and smooth seam surface. ✓
• Guaranteed welding strength for root and layer welding. ✓
• Safety against cold shuts and cracks.
• Welding in all positions, vertical up, down and overhead.
• Excellent fusion and penetration.
• Operation requires less manual skills.
• Welding area is easier to see.
• No heavy slag to control or to chip away, compressed gas seals the weld pool.
• Potentially cheaper.
• Welds a wider range of thickness.
• Welding wire runs from a spool and need not to be replaced regularly. (Any 5) ✓

4.2 4.2.1 Direct current. ✓

4.2.2 • More compact. ✓
• It is much lighter. ✓
• Use less current. ✓
• Uses lower ampere to weld. ✓
• More economical to use. ✓

4.2.3 • Yes. ✓
• Can easily weld aluminium if you reverse the polarity of the electrodes on the welding machine. ✓
4.3 Make a neat, labelled sketch of the forehand welding technique when welding with an oxy-acetylene welding apparatus.

Marks will be allocated for:

- Labels 5
- Sketch 2
- Neatness 1

4.4
- 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 ✓
- and therefore causes various types of distortion. (Any 4) (4)

4.5
- It is the process where worn parts can be built up ✓
- by padding with a wear resistant metal. ✓ (2)

[35]
QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

5.1 5.1.1 Universal joint. ✓ (1)

5.1.2 To manually grease the inner part of the universal joint, where lubrication is needed on a regular basis. ✓ (1)

5.1.3 • Strong. ✓
• Not become loose. ✓
• Weight saving.
• Must provide adequate/efficient protection. (Any 2) (2)

5.2 • Release all chains. ✓
• Release all belts. ✓
• Clean and wash machine properly ✓
• Dry machine ✓
• Grease all moving parts ✓
• Paint where necessary
• Cover whole machine (Any relevant answer) (Any 5) (5)

5.3 5.3.1 • Sliding gearbox. ✓
• Constant mesh gearbox. ✓
• Synchronised gearbox. ✓
• Automatic
• Semi-automatic
• Pre select
• Tip tronic (Any 3)

5.3.2 Noisy/excessive wear. ✓ (1)

5.4 5.4.1 \[ Na \times Da = Ng \times Dg. \]
\[ Dg = \frac{Na \times Da}{Ng} \]
\[ = \frac{1,500 \times 200}{3,000} \]
\[ = 100 \text{ mm} \] (3)

5.4.2 • 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 do not break easily under normal circumstances.
• Cold, moist conditions, age or use does not cause V-belts to stretch or shrink.
• V-belts last longer than flat belts. (2)

5.4.3 To change the direction of rotation on the pump. ✓ (1)
5.5 5.5.1
- Driving power.
- Local availability of parts and service.
- Rigidity of construction.
- Simplicity of control mechanisms.
- Driver comfort.
- Versatility.
- Proven reliability and durability.
- Cost
- Purpose
- Who is the operator Skilled or unskilled  (Any 5)  (5)

5.5.2
- Type of use. (Pulling a trailer or heavy implement like a plough or ripper)
- Maximum drive requirements
- Texture of the soil. (Clay or sand)
- Type of tractor. (4x4 and 2x4) (4 wheels – 8 wheels)  (4)

5.6 5.6.1
- Welger system/Roller system
- Vermeer system/Belt or chain system  (2)

5.6.2

<table>
<thead>
<tr>
<th>RECTANGULAR BALER</th>
<th>ROUND BALER</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Storage space optimally utilised. ✓</td>
<td>a) One man operation. ✓</td>
</tr>
<tr>
<td>b) Bales handled manually. ✓</td>
<td>b) Low rope consumption.</td>
</tr>
<tr>
<td>c) Continuous baling process. ✓</td>
<td>c) Simplistic working. ✓</td>
</tr>
<tr>
<td>d) Bales stored easily. ✓</td>
<td>d) Can bale until rain starts. ✓</td>
</tr>
<tr>
<td>e) Transport space optimally utilised. ✓</td>
<td>e) Roofed storage not necessary. ✓</td>
</tr>
<tr>
<td>f) Bales easily handled</td>
<td>f) Can be wrapped</td>
</tr>
</tbody>
</table>

(Any relevant answer)  [40]
QUESTION 6: WATER MANAGEMENT

6.1 6.1.1 • Installation costs are very high. ✓
      • Blockages occur from time to time and are expensive to correct. ✓
      • The installation requires technical skills and knowledge. ✓ (3)

6.1.2 • Trenches or ditches are dug to a depth of 0.5 m to 2 m. ✓
      • The trench has a steady fall to enable it to carry away the superfluous water which it collects from the surrounding soil. ✓
      • At the bottom of the trench, bush, poles, stones or tiles (pipes) are placed and then covered with earth. This helps with the movement of the water. ✓
      • The rocks or pipes are then covered with topsoil. ✓
      • In this way the whole of the drained area may be used for the cultivation of crops. ✓ (5)

6.2 • Buried deep enough not be damage by implements. ✓
      • Buried in sand. ✓
      • Couplings must be water tight. ✓
      • Lime layer 500 mm above pipe. ✓ (3)

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 sewerage remains and drains away through the outlet pipe or stone trench. ✓ (3)

6.3.2 • Do not build near boreholes/rivers or water sources. ✓
      • It must be a suitable distance away from the house. ✓
      • Not in the vicinity where people eat, wash or regularly work. ✓
      • Drinking water installations. ✓ (4)

6.3.3 • Sludge is not bio degradable ✓
      • and therefore it will accumulate until the tank overflows ✓
      • and therefore clog the drainage pipes and the soil into which they drain. ✓ (3)

6.3.4 • Use only toilet paper. ✓
      • No plastics or non degradable materials. ✓
      • No cigarette buds, rags etc. should get into the tank. ✓
      • No disinfectants should be used. ✓
      • No bleaches, oils. ✓ (5)
      • Don't over use
6.4 • To save water. ✓
• To prevent over-irrigation. ✓
• To prevent under-irrigation. ✓

6.5 • Between 3–5 metres ✓
• Dangerous, the sides may fall in. ✓

TOTAL SECTION B: 160
GRAND TOTAL: 200