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Department:
Basic Education
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NATIONAL SENIOR CERTIFICATE

GRADE 12

AGRICULTURAL TECHNOLOGY

FEBRUARY/MARCH 2015

MARKS: 200

TIME: 3 hours

This question paper consists of 16 pages.

INSTRUCTIONS AND INFORMATION

1. GENERAL INSTRUCTIONS AND INFORMATION
 - 1.1 This question paper consists of TWO sections, namely SECTION A and SECTION B.
 - 1.2 BOTH sections are COMPULSORY.
 - 1.3 Answer ALL the questions in the ANSWER BOOK.
 - 1.4 Number the answers correctly according to the numbering system used in this question paper.
 - 1.5 Non-programmable calculators may be used.
 - 1.6 Write neatly and legibly.
2. SECTION A: SHORT QUESTIONS
 - 2.1 This section consists of THREE questions.
 - 2.2 Follow the instructions when answering the questions.
3. SECTION B: STRUCTURED LONG QUESTIONS
 - 3.1 This section consists of FIVE questions.
 - 3.2 Start EACH question on a NEW page.

SECTION A**QUESTION 1**

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1.1–1.1.10) in the ANSWER BOOK, for example 1.1.11 B.

- 1.1.1 The adhesive that will be best suited for repairing a water tank made of glass used for fish farming:
- A Epoxy
 - B Silicon
 - C Resorcinol
 - D Latex
- (2)
- 1.1.2 The factor that does NOT contribute to tractor roll-overs when carrying out tasks on the farm:
- A Cornering at high speeds
 - B Carrying loads too high on the front-end loader
 - C Connecting an implement underneath the hitching point of a tractor
 - D Working in a steep ditch, on a hill or a washout
- (2)
- 1.1.3 ONE of the following has no influence on the depth-control system of a tractor:
- A Increased wheel base of the tractor
 - B Ploughing depth
 - C Soil resistance
 - D Forward speed of the tractor
- (2)
- 1.1.4 A synthetic material such as ... is best known for its heat resistant properties.
- A Perspex
 - B rubber
 - C Prestik
 - D bakelite
- (2)
- 1.1.5 The prescribed size for a warning sign on an electric fence is at least ...
- A 100 mm x 200 mm.
 - B 200 mm x 300 mm.
 - C 300 mm x 400 mm.
 - D 500 mm x 600 mm.
- (2)

- 1.1.6 ... can NOT be used as a pipe-welding position.
- A Horizontal fixed position
 - B Vertical position
 - C Machine spot welding
 - D Horizontal movable position
- (2)
- 1.1.7 The ... is/are NOT part of the three-point mechanism of the tractor.
- A lifting arms
 - B top link
 - C power take-off shaft
 - D stabilising chains
- (2)
- 1.1.8 Faulty drum speed of the combine harvester causes ...
- A kernels to be blown out by the blower of the machine.
 - B kernels of different sizes to be collected in the collecting bin.
 - C V-belts to be thrown from their pulleys.
 - D kernels not being removed from the stalks.
- (2)
- 1.1.9 To adjust the cross-angle of an implement in relation to the tractor's forward movement you will use a ...
- A levelling box.
 - B top link.
 - C depth-control mechanism.
 - D depth-control lever.
- (2)
- 1.1.10 Bronze can easily be joined by ...
- A arc-welding.
 - B MIG-welding.
 - C soldering.
 - D TIG-welding.
- (2)

1.2 Change the UNDERLINED word(s) in each of the following statements to make the statements TRUE. Write only the answer next to the question number (1.2.1–1.2.5) in the ANSWER BOOK, for example 1.2.6 Tractor.

1.2.1 Acetylene gas is used with CO₂ in MIG-welding. (2)

1.2.2 A(n) gas flame melts the metal when cutting with a plasma cutter. (2)

1.2.3 The process where water is sent through different liquids that are separated by a permeable film which allows water to pass through on a molecular level is called forward osmosis. (2)

1.2.4 Teflon protects the metal parts of the irrigation system against corrosion. (2)

1.2.5 A GPS is a modern technological device that can be used to start or stop an irrigation system over long distances. (2)

1.3 Choose a word/term from COLUMN B that matches the description in COLUMN A. Write only the letter (A–G) next to the question number (1.3.1–1.3.5) in the ANSWER BOOK, for example 1.3.6 H.

COLUMN A	COLUMN B
1.3.1 Elements used in the manufacturing of brass components	A single action
1.3.2 The device used by crop farmers to measure soil water content	B class A evaporation pan
1.3.3 The instrument used to determine evapotranspiration in a specific field	C channel drain
1.3.4 Long, narrow concrete drains used to move large amounts of water	D French drain
1.3.5 A hydraulic cylinder installed in the steering mechanism of a back acter	E neutron probe
	F double action
	G copper and zinc

(5 x 2) (10)

TOTAL SECTION A: 40

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

Start this question on a NEW page.

- 2.1 Give TWO reasons why each of the following alloy metals is used to manufacture the product below:
- 2.1.1 Stainless steel in the manufacturing of milk tanks (2)
 - 2.1.2 Copper in the manufacturing of electrical conductors (2)
 - 2.1.3 Brass in the manufacturing of pipe fittings (2)
- 2.2 Name the alloy element commonly used with tin to form soft solder. (1)
- 2.3 Name FIVE conditions under which an adhesive could be used that should be taken into consideration when an adhesive is bought. (5)
- 2.4 Give FIVE reasons why farmers would prefer fibre-glass water drinking troughs for animals. (5)
- 2.5 Teflon-coated products, such as cooking equipment, are well known in the industry. Describe FIVE advantages of Teflon-coated products. (5)
- 2.6 The charger (energiser) in the photo below provides the energy needed for the electric fence to work effectively.



- 2.6.1 Name TWO methods that can be implemented to prevent lightning strikes from damaging the energiser. (2)
- 2.6.2 Indicate the minimum distance that the earth wire/spike of the above energiser must be away from any other electrical system. (1)
- 2.6.3 Name, apart from lightning, THREE elements of nature that is extremely harmful to electric-fence energisers. (3)

- 2.6.4 Sand, very dry soil or dry plant material can cause an inefficient earth connection. Describe TWO ways of increasing the earthing efficiency when erecting an electric fence. (2)
- 2.6.5 Name FIVE requirements that should be met by warning plates that are attached to electric fences. (5)
- [35]**

QUESTION 3: ENERGY

Start this question on a NEW page.

- 3.1 Wind power converts kinetic energy present in the wind, into mechanical energy and then into electrical energy.
- 3.1.1 How can the energy produced from this device be stored efficiently for use during windless days? (1)
- 3.1.2 Describe THREE disadvantages of wind energy that will influence your choice when choosing an alternative energy source. (3)
- 3.2 The earth contains a considerable untapped energy source in the form of heat.
- 3.2.1 Name the heat energy that is extracted from the earth's inner core. (1)
- 3.2.2 Describe TWO important issues that can be raised during the initial survey phase before exploration of the energy source commences. (2)
- 3.3 Bio-fuel is any plant or animal matter which is combustible and can be used as a fuel for engines on a farm.
- 3.3.1 Give THREE advantages of bio-fuel. (3)
- 3.3.2 Name TWO common alternative fuels that are obtained from plant origin. (2)
- 3.4 The solar panels shown below are used to generate electricity through solar (sun) energy. Explain the process that takes place in solar panels to transform sun energy into electricity.



- 3.5 Discuss FOUR disadvantages of solar energy. (4)
- [20]**

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

Start this question on a NEW page.

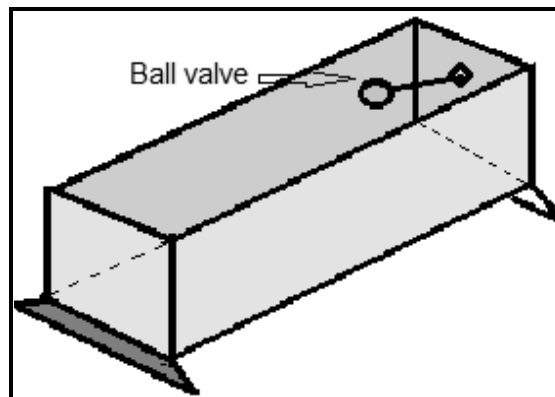
- 4.1 The photograph below shows the tip of the nozzle of a MIG welder.



- 4.1.1 A farm worker was repairing an implement with the aid of a MIG welding machine. Suddenly the wire fused itself to the welding tip.
Give TWO reasons for this problem. (2)
- 4.1.2 Name TWO methods used to solve the problem mentioned in QUESTION 4.1.1. (2)
- 4.1.3 Give TWO reasons for the occurrence of welding spatter when using the MIG welding machine. (2)
- 4.1.4 Describe TWO measures that can be applied to solve the problem of welding spatter. (2)
- 4.2 Welding galvanized steel is very dangerous. Give TWO reasons to support this statement. (2)
- 4.3 Describe the correct process of overhead arc-welding. (4)
- 4.4 Name THREE hazards to take into consideration when working with the plasma cutter. (3)

4.5 Read the scenario below and answer the questions that follow.

You are the manager of a dairy farm. You are experiencing problems with the water trough, as shown below, due to the cattle damaging the ball valve. You have to design a cover to protect the ball valve. The width of the trough is 500 mm and the length of the ball valve is 600 mm. The material available to build the cover is 25 mm x 6 mm angle iron and 25 mm x 6 mm flat bar.



4.5.1 Make a freehand sketch of the top of your design to protect the ball valve mechanism. (3)

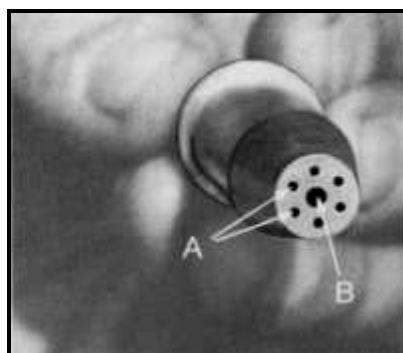
4.5.2 Indicate TWO essential measurements on the sketch. (2)

4.5.3 Indicate TWO types of welding joints that can be used. (2)

4.5.4 Supply a cutting list of the material that you will need. (3)

4.5.5 Name a method that can be used to prevent the metal grid from rusting. (1)

4.6 A photograph of an oxyacetylene cutting nozzle is shown below. Answer the questions that follow.



4.6.1 Name TWO types of metals that can be cut by using an oxyacetylene cutting torch. (2)

4.6.2 Explain the oxyacetylene cutting process from the moment the flame has been lit up to the moment that the cut is finished. (5)

[35]

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

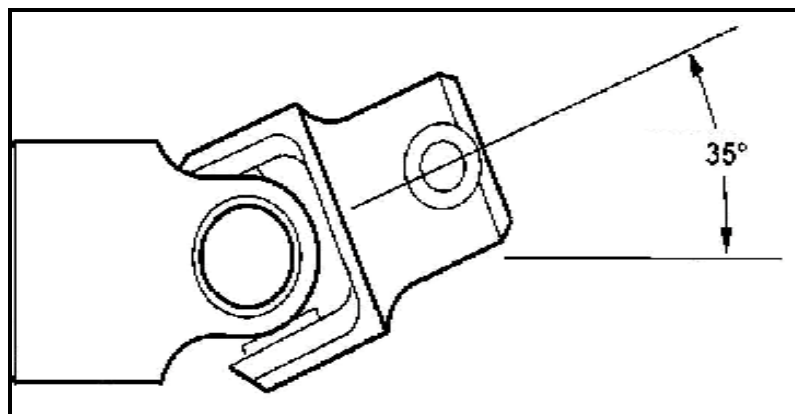
Start this question on a NEW page.

5.1 The following questions are based on the standardisation of farm implements.

5.1.1 Give the main aim of the standardisation of farm implements. (1)

5.1.2 Give THREE advantages of farm implement standardisation. (3)

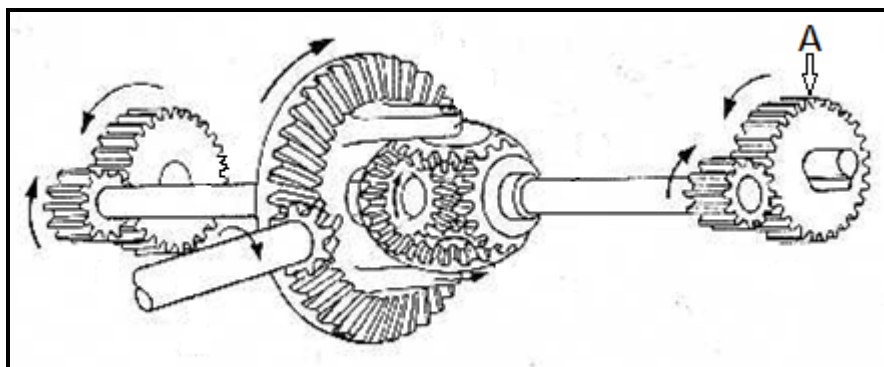
5.2 The sketch below shows a power take-off (PTO) shaft that can be used between a tractor and implements to provide drive to the implement.



5.2.1 Name the component in the above picture that allows the drive shaft to be used at different operating angles. (1)

5.2.2 Explain the purpose of a bearing. (2)

5.3 The sketch below shows a differential with a final drive assembly as found in a bulldozer.

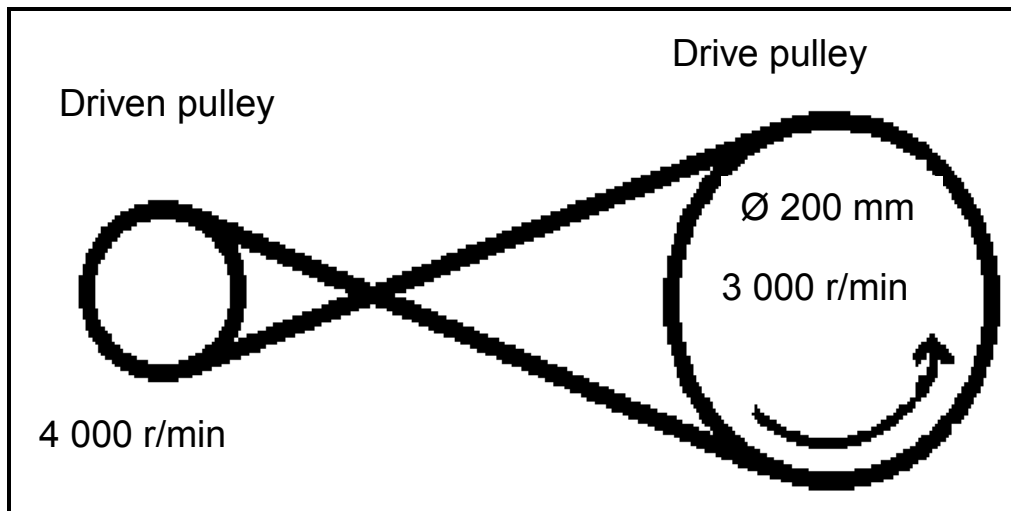


5.3.1 Name TWO functions of a differential. (2)

5.3.2 State the function of a differential lock. (1)

5.3.3 Give the main function of the final drive in the sketch above as indicated by arrow **A**. (1)

- 5.4 The drive between the engine and the differential needs to be disengaged when gears are changed. This is done with the aid of a clutch. Describe THREE properties of a good clutch. (3)
- 5.5 The sketch below shows two pulleys connected with a V-belt as found in the drive system of a hammer mill.



- 5.5.1 Calculate the diameter of the driven pulley by using the following formula:

$$N_a \times D_a = N_g \times D_g$$

Where:

N_a = Speed of driving pulley

D_a = Diameter of driving pulley

N_g = Speed of driven pulley

D_g = Diameter of driven pulley

(5)

- 5.5.2 Indicate the direction in which the driven pulley rotates. (1)

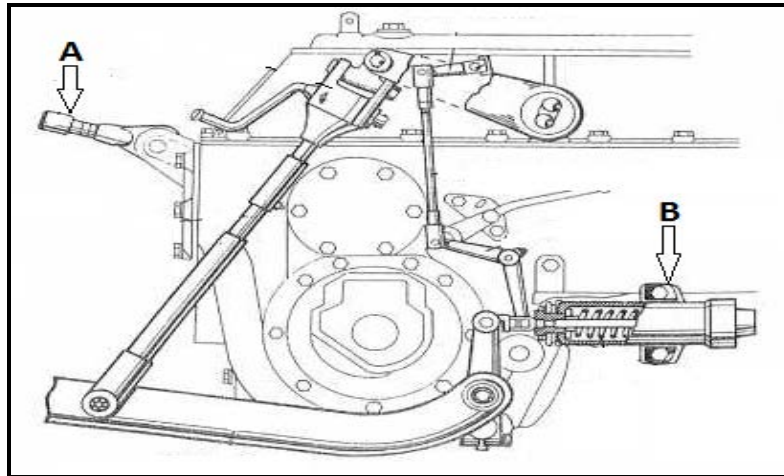
- 5.5.3 Explain THREE safety precautions to consider when attaching the hammer mill to the PTO shaft of the tractor. (3)

- 5.6 Farm machines use several V-belts in their operation systems.

- 5.6.1 Name THREE advantages of using V-belts instead of flat belts. (3)

- 5.6.2 V-belts must always be covered by a screen to safeguard people from injury. State THREE requirements of the screens used for safeguarding implements. (3)

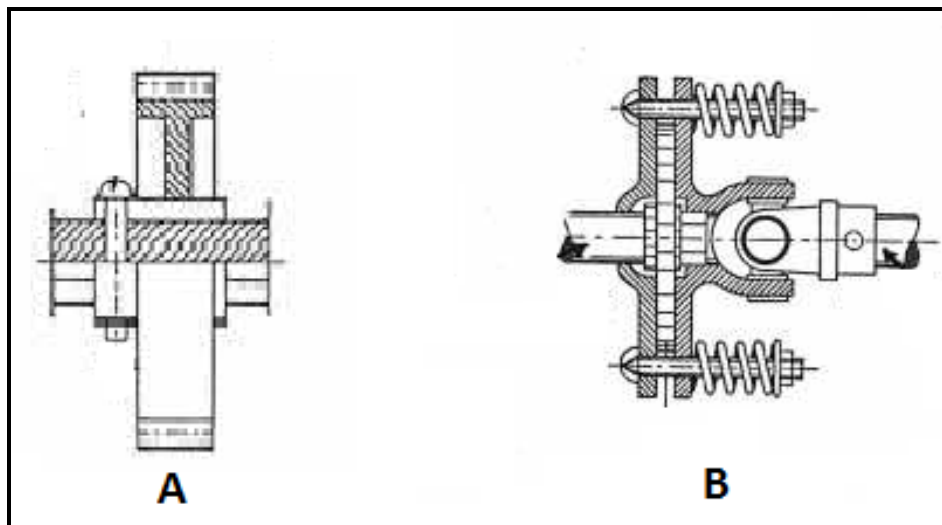
5.7 Refer to the sketch below and answer the questions that follow.



5.7.1 Identify component **A**. (1)

5.7.2 Identify component **B** and explain its function. (2)

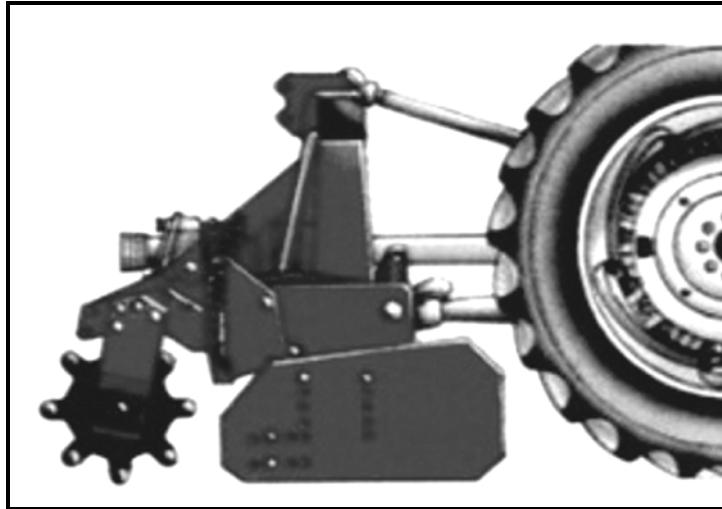
5.8 Sketch **A** shows a shear bolt and sketch **B** a slip clutch. Both are safety devices used on a baling machine.



5.8.1 Which ONE of the safety devices (**A** or **B**) will allow the tractor driver to proceed immediately with a task after the obstruction has been removed? (1)

5.8.2 State THREE functions of the slip clutch found in the drive mechanism of a baling machine. (3)

5.9 The picture below shows a rotavator used on a farm.



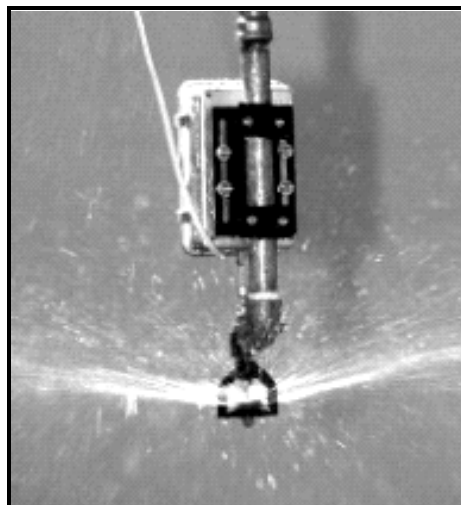
Describe the procedure that should be followed when a rotavator is prepared for use.

(4)
[40]

QUESTION 6: WATER MANAGEMENT

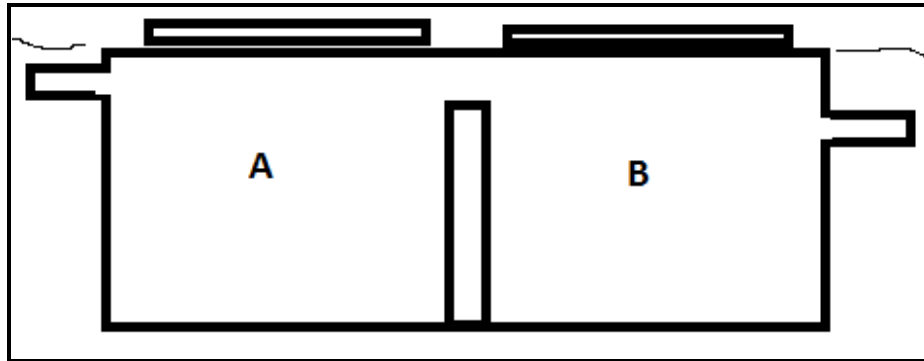
Start this question on a NEW page.

- 6.1 Describe the basic procedures that must be followed when selecting a pump for a new irrigation system. (4)
- 6.2 Give a reason for dividing a garden irrigation system into different zones. (1)
- 6.3 The picture below shows a spray nozzle which is normally fitted to an overhead irrigation system.



- Name the spray nozzle indicated in the picture. (1)
- 6.4 What is the function of an irrigation valve? (1)
- 6.5 Discuss THREE factors to consider when purchasing an irrigation sprinkler system. (3)
- 6.6 The success of sprinkler irrigation depends on how well it functions. Explain the working of an irrigation sprinkler. (3)
- 6.7 Name TWO criteria that will influence the farmer's decision on the time for irrigating a crop. (2)
- 6.8 The sprinkler head of a fire suppression sprinkler system is attached to the ceiling with the top of the head facing down. Explain the working of this fire suppression sprinkler system. (3)

- 6.9 A schematic illustration of a septic tank is shown below. Answer the questions that follow.



- 6.9.1 A typical household sewage treatment system should consist of two compartments, **A** and **B**. Briefly explain the functions of each of the TWO compartments. (4)
- 6.9.2 Name THREE criteria that must be followed when maintaining a septic tank. (3)
- 6.10 Name THREE places where a septic tank may NOT be built. (3)
- 6.11 Precision farming is an integration of several technologies that are essential for modern-day farming practices. The most important of these technologies are GPS devices.
- 6.11.1 What does the abbreviation *GPS* stand for? (1)
- 6.11.2 How can a farmer use a GPS device? (1)

[30]

TOTAL SECTION B: 160
GRAND TOTAL: 200