



STUDENT NUMBER

CENTRE NUMBER

HIGHER SCHOOL CERTIFICATE EXAMINATION

1996

RURAL TECHNOLOGY

2 UNIT
(85 Marks)

*Time allowed—Three hours
(Plus 5 minutes' reading time)*

EXAMINER'S USE ONLY

Question	
2	
3	
4	
5	
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7	
8	

DIRECTIONS TO CANDIDATES

- Write your Student Number and Centre Number at the top right-hand corner of this page.
- Attempt ALL Sections.
- The marks allocated to each Section are shown in this paper.
- Write your answers in the spaces provided in this paper.
- Board-approved calculators may be used.

SECTION I—FARM MACHINERY

(20 Marks)

QUESTION 1

'AH' Series Rotavation. AH Rotavator pamphlet.



FIG. 1. ROTARY HOE

- (a) Name the inventor of the rotary hoe?

- (b) What were the TWO important innovations claimed by the inventor of the rotary hoe at the time?
- (i)
- (ii)
- (c) What is the main purpose of the rotary hoe?

QUESTION 1. (Continued)

- (d) Explain how the rotary hoe tills the soil.

.....

.....

- (e) How is the rotary hoe attached to the tractor?

.....

.....

- (f) Give TWO ways of achieving a finer tilth with the rotary hoe.

(i)

(ii)

- (g) The rotary hoe is powered off the tractor. As the tractor turns or the rotary hoe is raised or lowered, describe with the aid of a sketch:

- (i) how the power is transferred through an angle;

.....

.....

- (ii) how the changing length between the tractor and the rotary hoe is compensated for.

.....

.....

QUESTION 1. (Continued)

(h) What are TWO advantages of the rotary hoe over other tilling methods?

(i)

(ii)

(i) What are TWO limitations of the rotary hoe?

(i)

(ii)

(j) Name THREE types of hay-baling systems, giving advantages and disadvantages of each.

	<i>Type/name</i>	<i>Advantage</i>	<i>Disadvantage</i>
(i)			
(ii)			
(iii)			

QUESTION 1. (Continued)

'Combine harvesting, G Griffin, John Deere Services Publications 1973, p12.

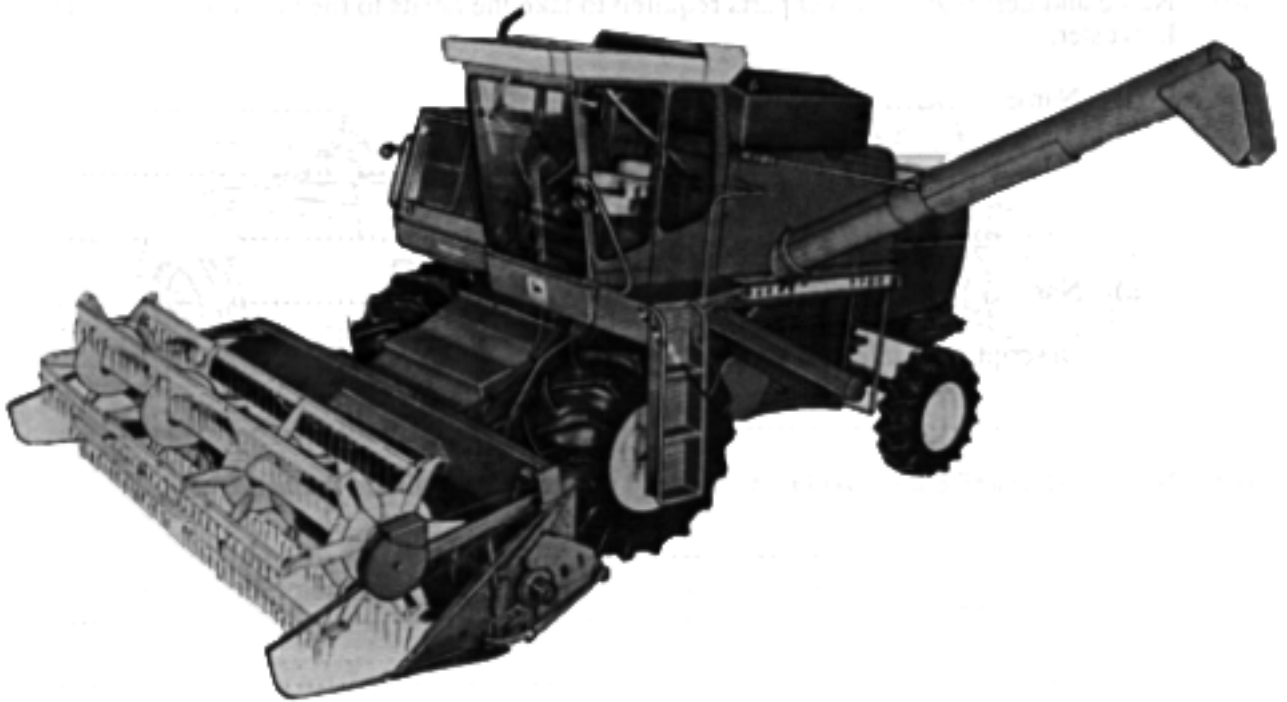


FIG. 2. WHEAT HARVESTER

- (k) What was Ridley's contribution to the development of the wheat harvester?

.....

- (l) What further improvements did H.V. McKay make to the wheat-harvesting machine?

.....

- (m) Name and describe TWO of the parts used in a modern harvester for cutting heads off wheat.

(i) Name

Description

.....

(ii) Name

Description

.....

QUESTION 1. (Continued)

(n) Name and describe the TWO parts required to take the heads to the threshing part on the harvester.

(i) Name

Description

.....

(ii) Name

Description

.....

(o) Name and describe the TWO parts required to thresh the grain on the harvester.

(i) Name

Description

.....

(ii) Name

Description

.....

(p) Name and describe the TWO parts required to clean the grain on the harvester.

(i) Name

Description

.....

(ii) Name

Description

.....

QUESTION 1. (Continued)

'Tillage', frank buckingham, john Deere Service Publications 1976, p113 fig 19

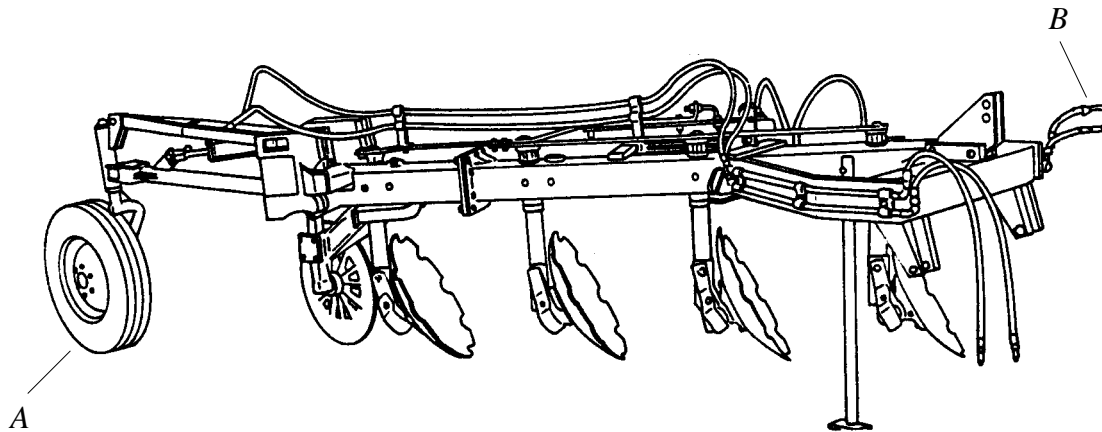


FIG. 3

- (q) Give the full name of the implement shown in Figure 3.

Name.....

- (r) What is the main purpose of the implement shown in Figure 3?

.....

- (s) Name and give ONE advantage and ONE disadvantage of the disk shape shown in Figure 3.

Name

Advantage

Disadvantage

- (t) Why are these disks tilted back?

.....

- (u) How can this tilt angle be changed?

.....

- (v) Give TWO functions of the wheel at A in Figure 3.

(i)

(ii)

QUESTION 1. (Continued)

(w) There are two hoses indicated at B in Figure 3.

(i) Why are there two hoses?

.....

(ii) What do the hoses control?

.....

(x) The hoses shown at B are connected to a cylinder. With the aid of a cross-sectional sketch, show how they control the cylinder.

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SECTION II—FARM STRUCTURES

(10 Marks)

QUESTION 2

Figure 4 shows a topographical map of a farm that is transected by a public road.

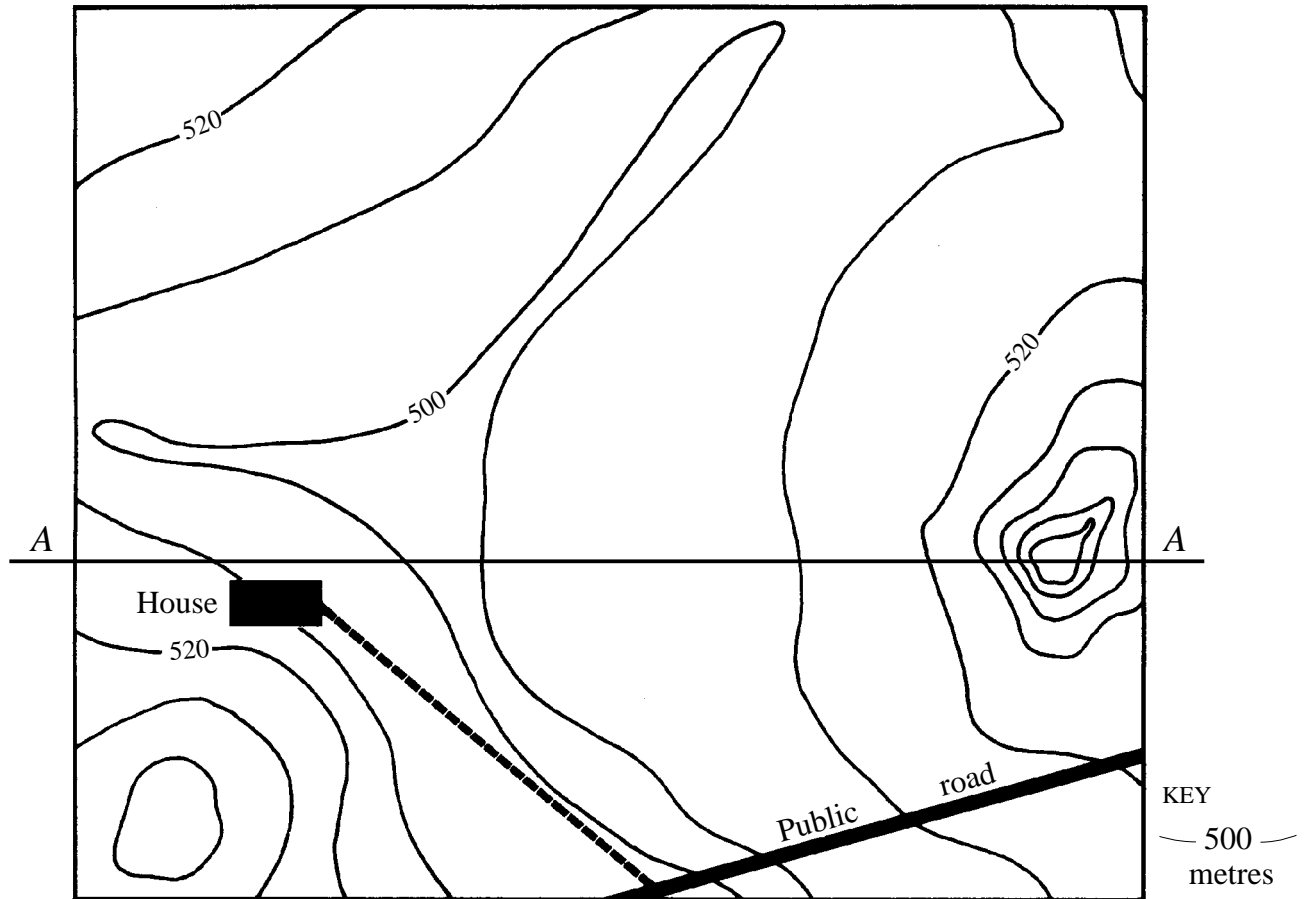
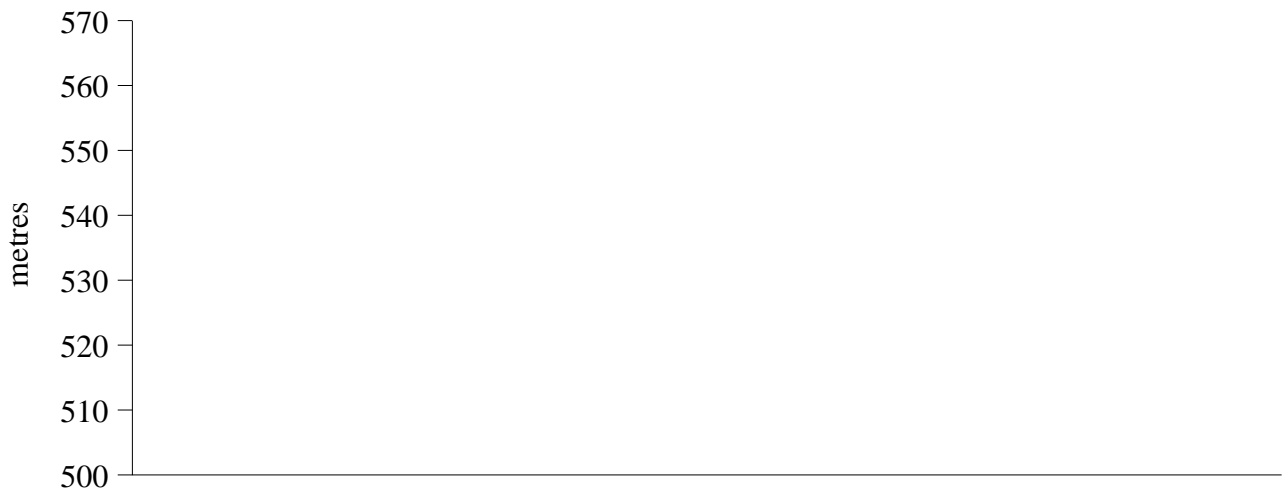


FIG. 4. TOPOGRAPHICAL MAP

- (a) (i) Draw a cross-section of the country indicated by the transverse line A—A.



QUESTION 2. (Continued)

- (ii) Indicate on the map where the creek would flow. Label it with the word 'creek'.
 - (iii) Place a large *S* on the map to indicate the area of the farm *least* likely to be affected by soil erosion.
- (b) The following questions refer to planning total-farm layout.
- (i) State TWO factors that should be considered when siting road access.
 - 1.
 - 2.
 - (ii) Give TWO factors to be considered when siting houses and farm buildings.
 - 1.
 - 2.
 - (iii) State ONE reason why dams should lie higher than the home site.
 -
 - (iv) Explain why gullies and creeks should not be used for effluent disposal.
 -
 -
 - (v) List THREE factors to be taken into consideration when siting sheep and cattle yards.
 - 1.
 - 2.
 - 3.
- (c)
- (i) State THREE factors to be considered when selecting material for strainer assemblies.
 - 1.
 - 2.
 - 3.
 - (ii) List THREE places where strainer assemblies would normally be placed.
 - 1.
 - 2.
 - 3.

QUESTION 2. (Continued)

(iii) State THREE functions of a fence-dropper.

1.
2.
3.

(iv) Explain why insulators are necessary on an electric fence.

.....
.....

(v) List THREE main types of energisers used on electric fences.

1.
2.
3.

(vi) In the space provided, draw a typical permanent electric fence, and label each part.

QUESTION 2. (Continued)

- (d) A rectangular cattle paddock has to be fenced. The area to be fenced is $200\text{ m} \times 300\text{ m}$ and the type of fence to be used is shown in Figure 5. Complete Table 1 and then calculate the total cost of the fencing.

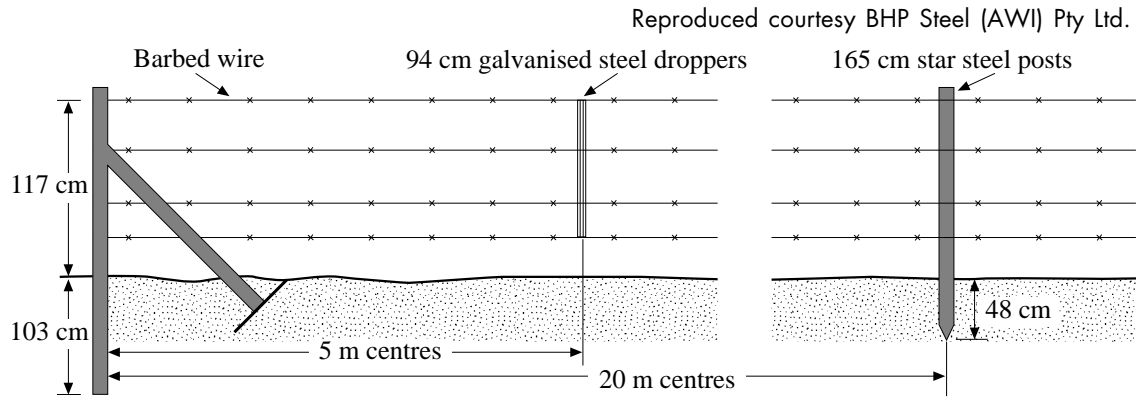


FIG. 5. STATION CATTLE FENCE

TABLE 1

<i>Component of fence</i>	<i>Number required</i>	<i>Cost/unit</i>	<i>Total cost of components</i>
Corner/strainer assembly		\$60	
Barbed wire		\$30 per 400 metre roll	
Steel droppers		\$1	
Posts		\$5	
Total cost of fencing =			

SECTION III—FARM GRAPHICS

(20 Marks)

Question 3 is COMPULSORY.

You must also answer *EITHER* Question 4 *OR* Question 5.

QUESTION 3. (12 marks)

An exploded isometric drawing of a single jaw from a four-jaw lathe chuck is shown in Figure 6. Using the starting lines on page 15, complete the following orthogonal drawings of the jaw assembly.

- A front view in the direction of arrow *F*.
- A top view.

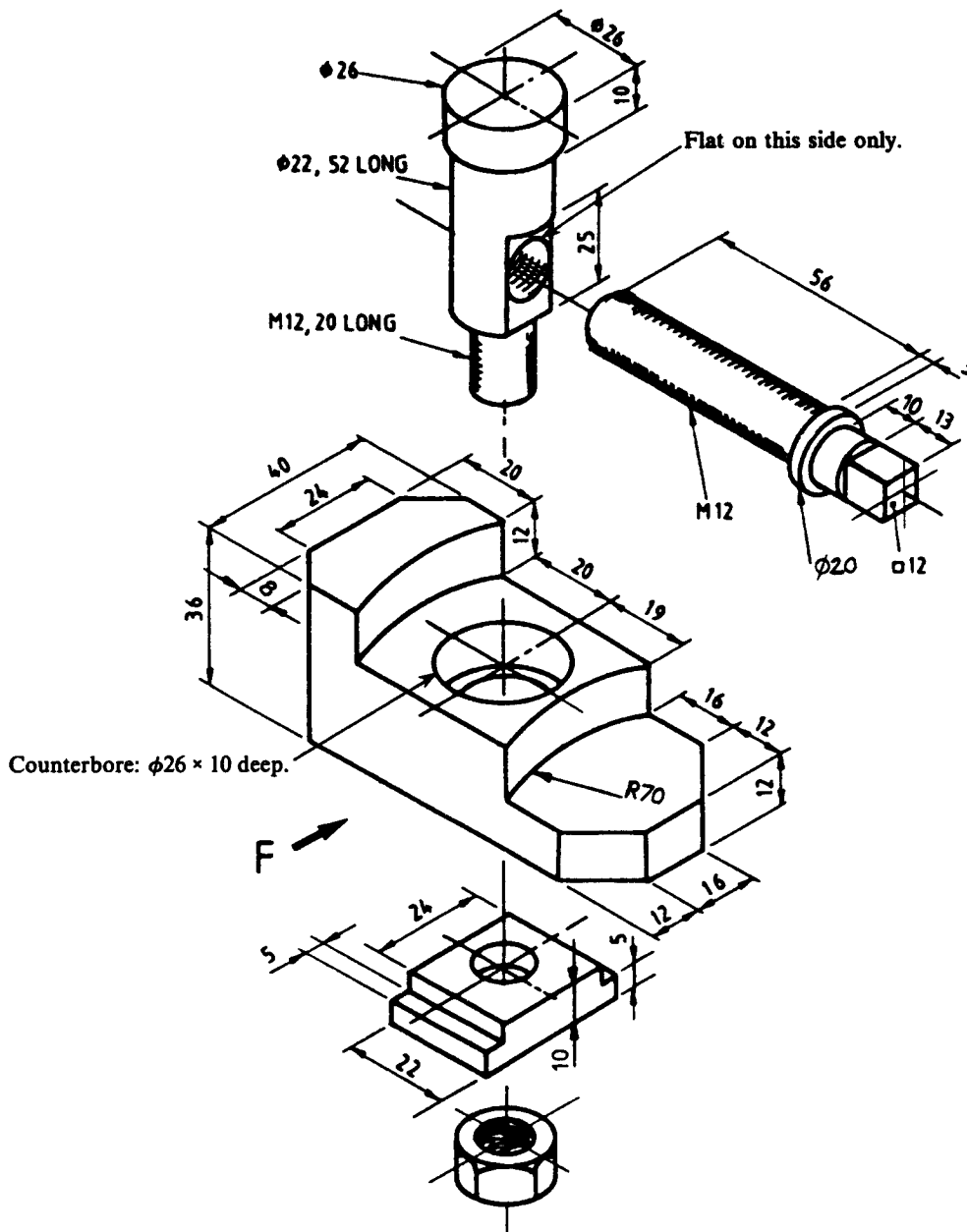
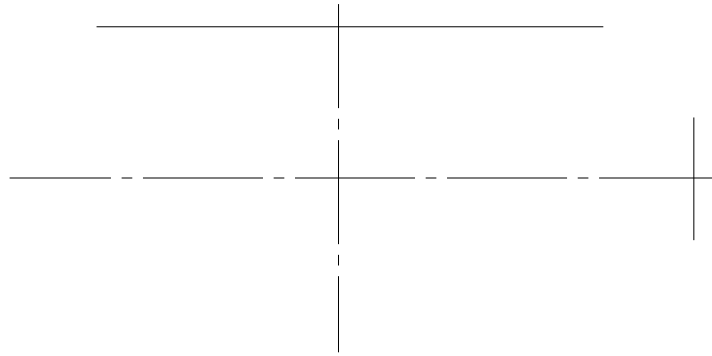
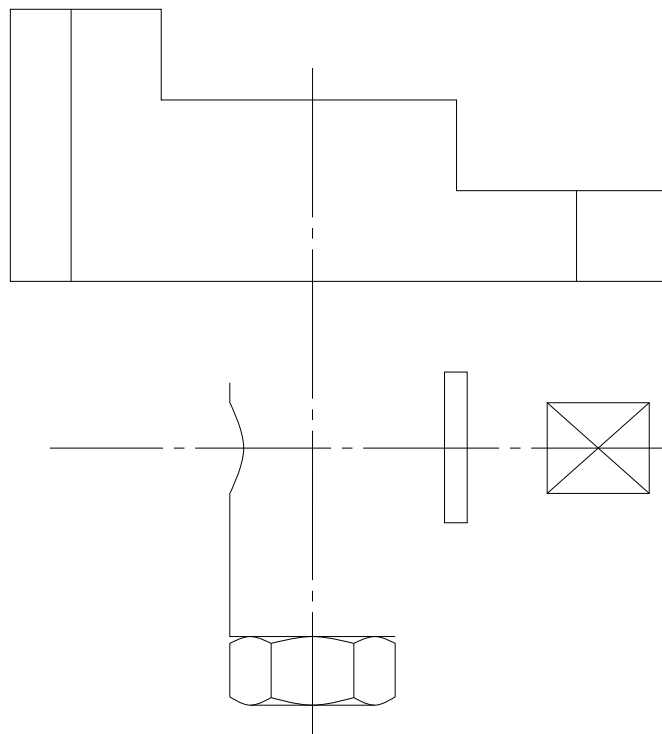


FIG. 6

QUESTION 3. (Continued)



TOP VIEW



FRONT VIEW

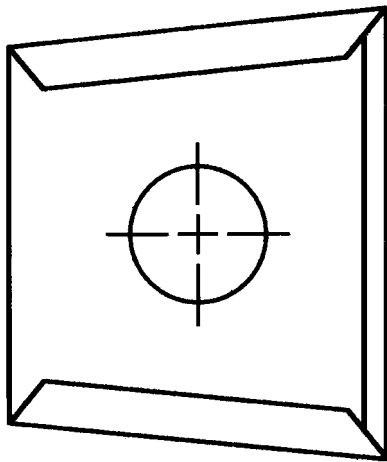
QUESTION 4. (8 marks)*EITHER*

Orthogonal and pictorial drawings of a nozzle shroud are given in Figure 7 below.

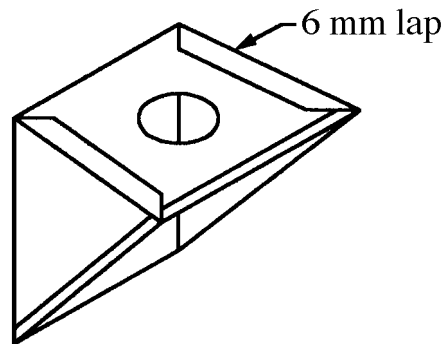
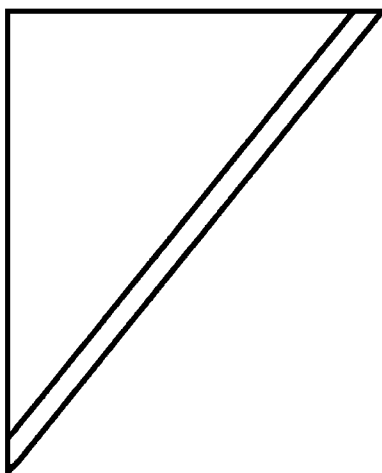
On page 17, draw a full-size development of the nozzle shroud.

Add 3 mm folded edges and a 6 mm lap on the seams.

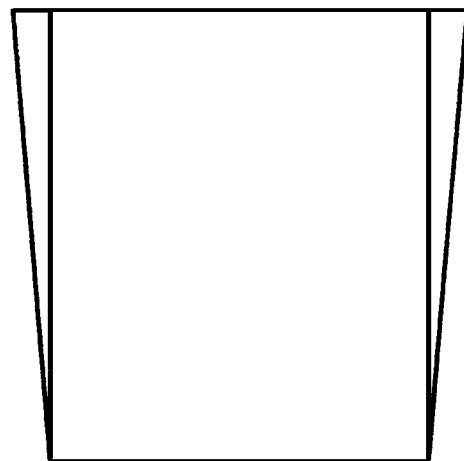
Take dimensions directly from the orthogonal views given in Figure 7 below.



TOP VIEW

Pictorial drawing of nozzle shroud
(NOT TO SCALE)

FRONT VIEW



SIDE VIEW

FIG. 7

OR

QUESTION 4. (Continued)

QUESTION 5. (8 marks)

Figure 8 shows an orthogonal drawing of a spray nozzle at one stage in its production.

Draw an isometric drawing, as viewed in the direction of the arrow. Use the centre line as a guide to make the drawing on page 19, taking sizes direct from Figure 8.

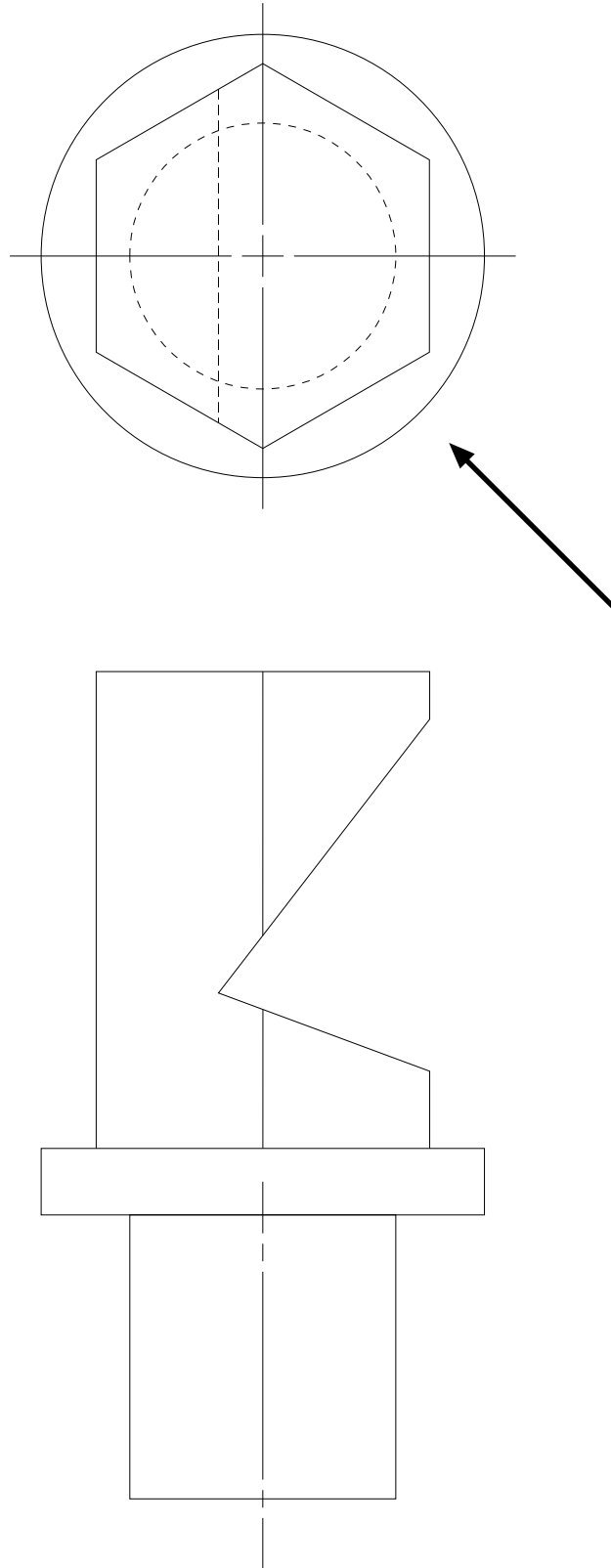


FIG. 8

QUESTION 5. (Continued)

SECTION IV—RELATED MATERIALS SCIENCE

(10 Marks)

QUESTION 6

- (a) In the space below, draw, in graphical form, a force of 30 kN acting at 60° to the horizontal. Use a scale of 10 mm = 5 kN.

- (b) Name the TWO characteristics that must be provided to define fully a force.

(i)

(ii)

- (c) A tension wrench is being used to tighten a nut on a transmission axle. If the tightening force of 280 N is applied to the wrench handle 400 mm from the bolt axis, calculate the tightening torque. Show all working.

Tightening torque..... N m

QUESTION 6. (Continued)

- (d) By applying a constant force of 30 kN, a tractor moves a load a distance of 25 metres across the shed floor in 1.5 minutes.

(i) Ignoring any friction effects, calculate the work done by the tractor.

Work done J

(ii) Calculate the power required to carry out this task.

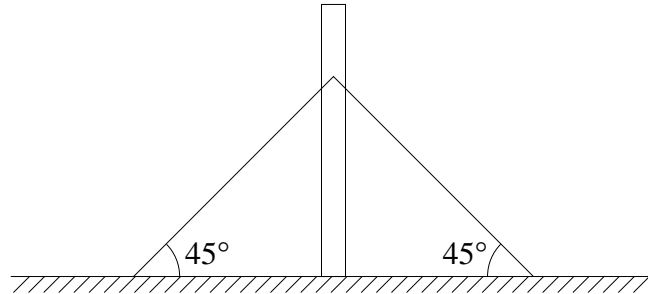
PowerW

- (e) A 5 tonne truck is carrying a load to the local depot. After travelling at 40 km/h for 20 minutes, it accelerates to 60 km/h in 30 seconds. Calculate the truck's acceleration. Show all working.

Acceleration

QUESTION 6. (Continued)

- (f) Two wires are used to support a post, as shown in the sketch. If the tension in each wire is 5 kN, calculate the force developed in the post.



Force kN

- (i) Name the *type* of force developed in the post.

Type

- (ii) What *magnitude* of force is developed in the ground at the base of the post as a result of the force developed in the post?

Magnitude

- (iii) The force developed in the ground as a result of the force in the post is an example of one of Newton's laws. State this law.

.....

- (g) A number of boards are sawn from a log and seasoned ready for use. Name THREE common timber defects that may be found in these boards.

(i)

(ii)

(iii)

QUESTION 6. (Continued)

- (h) Describe what is meant by the term 'pressure impregnation of timber', and indicate its purpose.

- (i) Definition

.....

.....

- (ii) Purpose

.....

.....

- (i) Answer the following questions relating to dry rot in timber.

- (i) What is dry rot in timber?

.....

.....

- (ii) What conditions normally lead to dry rot?

.....

.....

- (iii) In which timbers in a small country cottage would dry rot most likely be found?

.....

.....

- (j) Describe briefly the life cycle of a typical borer. At which stage during this life cycle are these insects likely to attack timber?

- (i) Life cycle

.....

.....

- (ii) Stage at which timber is attacked.

.....

.....

QUESTION 6. (Continued)

- (k) Painting is the main means of preventing weathering of timber. Describe clearly the stages required to restore effectively a badly weathered timber window-frame.

.....

.....

.....

.....

SECTION V—FARM WATER SUPPLIES

(15 Marks)

QUESTION 7

(a) Explain with the aid of a sketch:

(i) why a centrifugal pump needs to be primed;

.....

.....

(ii) why a helical rotor-pump does not need priming.

.....

.....

(b) Describe the equipment necessary to set up a centrifugal pump on a river to ensure that priming is unnecessary.

.....

.....

.....

.....

Question 7 continues on page 26

QUESTION 7. (Continued)

- (c) Describe the process of priming a centrifugal irrigation pump.

.....

.....

.....

.....

- (d) In pumping water:

- (i) what is the suction head?

.....

- (ii) what limits the size of the suction head?

1.

2.

- (iii) what is the approximate maximum size of a suction head?

.....

- (e) What is the purpose of an absorption trench?

.....

.....

.....

.....

- (f) Draw a cross-section of a typical septic system used to handle domestic waste. Include typical sizes and materials used in the system.

QUESTION 7. (Continued)

- (g) Give THREE places where trees should be planted to help prevent soil loss. Explain what role the trees play and give a suitable tree species, explaining why each tree type is preferred.

		<i>Place 1</i>	<i>Place 2</i>	<i>Place 3</i>
(i)	Position			
(ii)	Role of tree in soil-loss prevention			
(iii)	Tree species			
(iv)	Reason preferred			

- (h) Name THREE sources of domestic drinking-water on the farm, other than the mains supply.

- (i)
- (ii)
- (iii)

- (i) Name and describe THREE methods that may be necessary to treat and purify domestic water in order to make it suitable for drinking.

Method 1

- (i) Name
- (ii) Description
-

Method 2

- (i) Name
- (ii) Description
-

Method 3

- (i) Name
- (ii) Description
-

SECTION VI—TOPICAL STUDY

THE USE OF CHEMICALS IN MODERN AGRICULTURAL ACTIVITIES

(10 Marks)

QUESTION 8

- (a) Farm chemicals can be a useful tool in the control of pests and disease, but hazards can be associated with their use. Complete the following questions with regard to minimising the hazards and improving personal safety.

(i) State THREE possible routes of entry of poisons into the human body.

1.
2.
3.

(ii) What THREE factors determine the level of hazard for operator poisoning?

1.
2.
3.

(iii) Name SIX items of individual protective safety clothing and equipment that should be worn when mixing and using farm chemicals.

1.
2.
3.
4.
5.
6.

(iv) Name FOUR essential items that farm-chemical users should include in their first-aid kit, in case of chemical poisoning.

1.
2.
3.
4.

QUESTION 8. (Continued)

- (v) The label on a farm-chemical container displays important safety precautions. Give FOUR safety directions that may appear on the label.

1.
2.
3.
4.

- (b) Careless use of farm chemicals can have a detrimental effect on the environment.

State TWO important requirements or practices that should be adopted to minimise environmental problems in the following situations.

- (i) Transporting of farm chemicals.

1.
2.

- (ii) Handling of chemicals on the farm.

1.
2.

- (iii) Disposal of unwanted chemicals and containers.

1.
2.

- (iv) Storage of unused farm chemicals.

1.
2.

- (c) Drift or movement of chemicals outside the target area can be a major problem during or after spraying.

List FOUR ways in which drift can be minimised.

- (i)
- (ii)
- (iii)
- (iv)

QUESTION 8. (Continued)

(d) A boom-sprayer driven by a power take-off is found to have too high a delivery rate.

(i) Give THREE changes that could be made to reduce the spray rate.

1.

2.

3.

(ii) Briefly outline how the calibration of a boom-sprayer's delivery rate could be checked.

.....

.....

.....

(iii) Give a reason why the evenness of spray application is important, and state TWO factors that control spray delivery evenness.

Reason

Factors

1.

2.

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