



TECHNOLOGY

Junior Certificate Examination, 2003

HIGHER LEVEL MARKING SCHEME

200 Marks

Sections A, B & C

INSTRUCTIONS

1. Answer Section A (short answer questions). 100 marks
2. Answer either (a) or (b) from each question in Section B. 50 marks
3. Answer one question from Section C. 50 marks
4. Hand up this paper at the end of the examination along with answer sheets for Section B and C.

Centre
Number

Examination
Number

Marks	Grade
170 - 200	A
140 - 169	B
110 - 139	C
80 - 109	D
50 - 79	E
20 - 49	F
0 - 19	NG

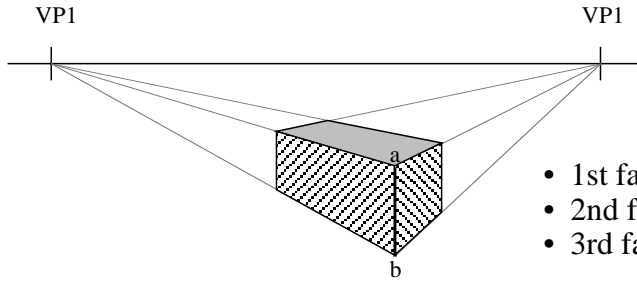
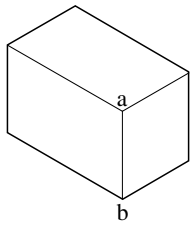
For Examiner	
Total Mark	<input type="text"/>
Question	Mark
Section A	100
Section B Q1 (a)	25
(b)	25
Q2 (a)	25
(b)	25
Section C Q3	50
Q4	50
Q5	50
Q6	50
Total	200
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MAKE SURE TO WRITE YOUR EXAMINATION NUMBER IN
THE BOX PROVIDED ON THIS PAGE

Section A Answer 25 questions from this section - all questions carry equal marks.

100 Marks

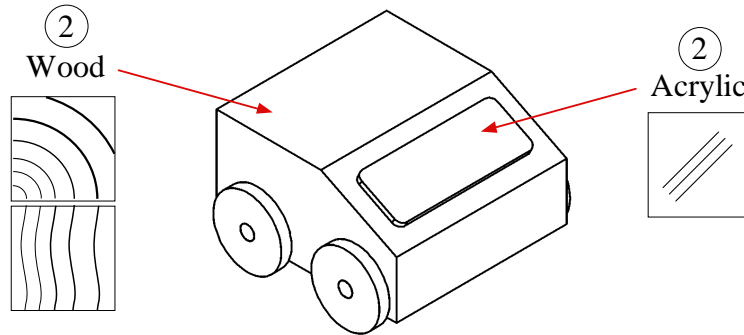
1. Complete the two point perspective of the object shown.



- 1st face* (2 marks)
- 2nd face (1 mark)
- 3rd face (1 mark)

NOTE: * Faces must show correct perspective, shading not reqd. Construction lines not required (must be used)

2. Use shading to indicate the materials shown on the sketch.



3. What does each of the symbols shown indicate?

(i)



(ii)



(i): • Wear eye protection (2 marks)
or equivalent statement

(ii): • Toxic or Poison (2 marks)

4. State the meaning of the following abbreviations.

(i) CD

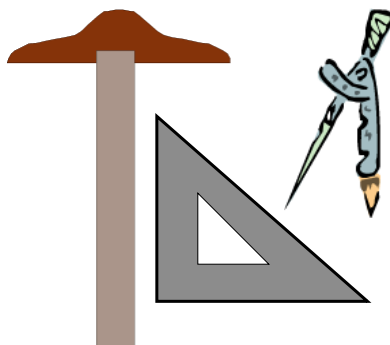
(ii) ROM



CD: • Compact Disk (2 marks)

ROM: • Read Only Memory (2 marks)

5. State **two** advantages of computer aided drawing over traditional drawing.



Advantage 1:
Advantage 2: (2 x 2 marks)

- Accuracy (CAD)
- or Functions available
- or Errors can be fixed
- or Faster, etc.

6. Name **two** synthetic fabrics.



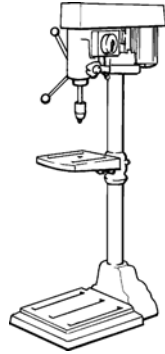
(i): (2 x 2 marks)

(ii):

- Nylon
- or Polyester
- or Kevlar, etc.

do not accept animal / plant derived material (wool etc.)

7. State **two** safety precautions which should be taken when drilling **thin material**.



(i): (2 x 2 marks)

(ii):

- Clamp workpiece (material)
- or wear goggles
- or support workpiece
- or remove chuck key
- or drill pilot hole
- or no loose hair, etc.

8. Name **one** suitable material for manufacturing each of the objects shown *and* give **one** reason for your selection.



(i) food container



(ii) key

(i) Material: • Plastic/Metal/Card(1 mark)

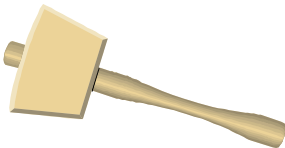
Reason: • Easily moulded (1 mark)
or can be mass produced
or hygienic, etc.

(ii) Material: • Metal/Alloy (1 mark)

Reason: • Strength (1 mark)
or hard wearing, etc.

9. Name each of the tools shown *and* suggest a suitable use for each.

(i)



(ii)



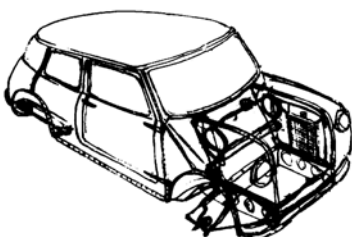
(i) Name: • Mallet(1 mark)

Use: • Valid use *associated with working with wood* (1 mark)
do not accept hammering nails

(ii) Name: • Hacksaw (1 mark)

Use: • Valid use *associated with working with metal/plastic* (1 mark)
do not accept cutting wood

10. Give **two** reasons why a car should be dismantled before scrapping.

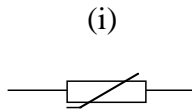


(i): (2 x 2 marks)

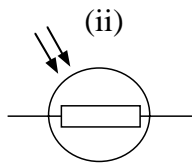
(ii):

- issues relating to recycling
- or removal of toxic/harmful materials
- or parts have re-sale value
- or environmentally friendly, etc.

11. Name the **two** electronic components represented by the symbols shown.

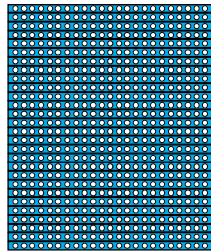


(i): • Thermistor (2 marks)
or temperature dependant resistor

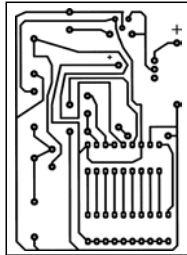


(ii): • LDR / ORP12 (2 marks)
or light dependant resistor

12. State **one** advantage of using a printed circuit board (PCB) in preference to VeroBoard.



VeroBoard

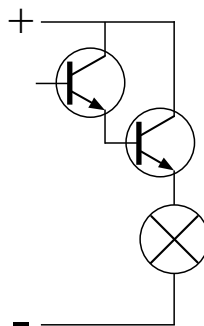


PCB

Advantage: • 1 Valid advantage (4 mark)

circuit construction faster/easier
or less likely to make errors
or neater circuits
or easier to place components
or mass production, etc.

13. Name the transistor arrangement shown, and state why it might be used.

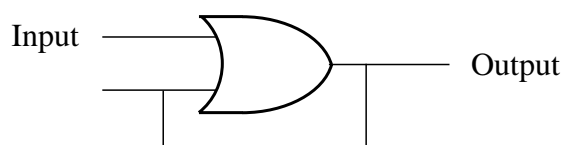


Arrangement: • Darlington pair (2 marks)

Why used: • for greater gain (2 marks)
or for greater amplification
or when small base current required to turn on bulb, etc.

14. The OR gate shown is configured as a latch.

Explain the term LATCH.



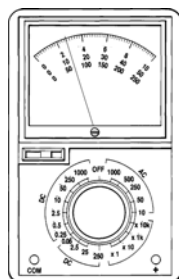
Latch: • Satisfactory explanation (4 marks)
sliding scale (1 - 4)

'When gate is triggered by initial input, output keeps input high even when initial input is removed'

'Output provides feedback to keep gate/latch 'on'

'Will not turn off unless reset'

15. Name the units used to measure each of the following :



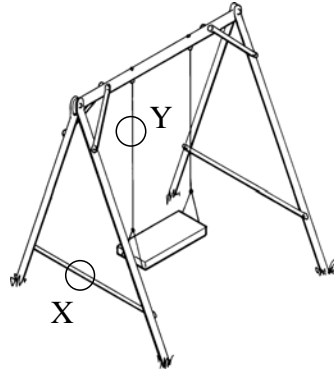
(i) Current: • Amps (amperes) (1 marks)

(ii) Voltage: • Volts (1 marks)

(iii) Power: • Watts (1 marks)

(iv) Resistance: • Ohms (1 marks)

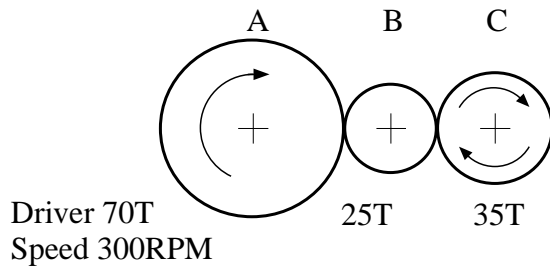
16. Name the forces acting in the members shown.



Force at X: • Tension (2 marks) or compression

Force at Y: • Tension (2 marks)

17. Calculate the speed and indicate clearly the turning direction of the driven gear 'C'.

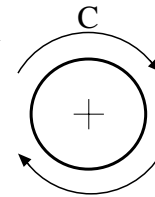


Speed: • **600** (rpm) (2 marks)

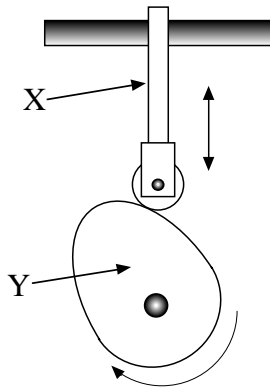
formula with correct values inserted allow 1 mark
ie $70 \times 300 = 35 \times Z$ or $70 \times 300 = 25 \times W(840) = 35 \times Z$

Direction: • 2 mark

• Clockwise



18. Name the parts labelled 'X' and 'Y' in the mechanism shown.

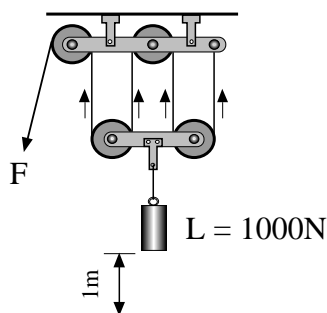


X: • Follower (2 marks)

Y: • Cam (2 marks)

19. Calculate the force 'F' required to hold the load 'L' with the pulley system shown.

Calculate the distance moved by the force 'F' if the load 'L' moves a distance of 1m.

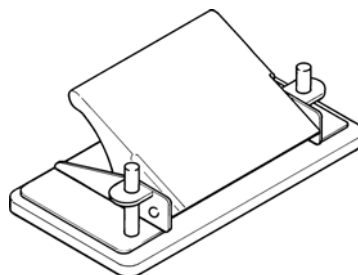


Force F: • **250(N)** (2 marks)
ie $1000N \div 4 = 250N$

Distance: • **4(m)** (2 marks)
ie $1m \times 4 = 4m$

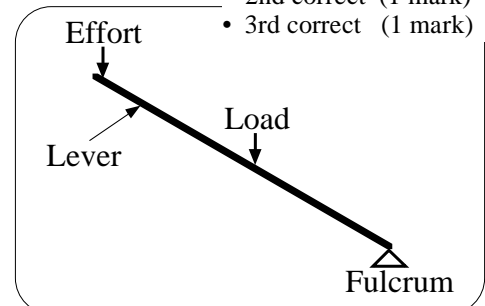
20. The paper punch shown is an example of a class 2 lever.

Complete the line diagram of the class 2 lever to show the position of the **fulcrum**, **load** and **effort**.

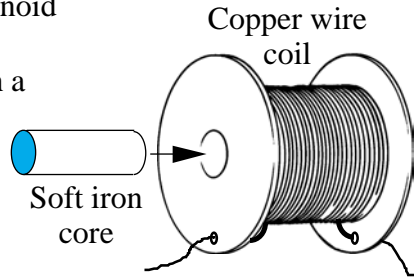


Sketch

- 1st correct (2 marks)
- 2nd correct (1 mark)
- 3rd correct (1 mark)



21. State **one** energy conversion taking place in a solenoid and give **one** use for such a solenoid.

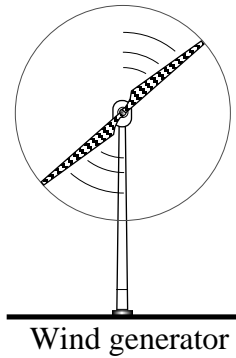


Energy conversion: • Electrical (1 mark) to Kinetic (1 mark)

Use: • 1 valid use (2 marks)

Relay
or Electric Bell
or Electric door release, etc.

22. State **two** reasons why it is important to invest in alternative energy sources.

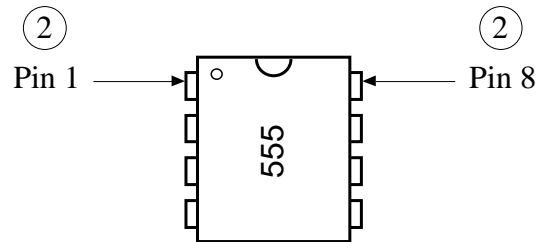


(i): (2 x 2 marks)

(ii): 2 different reasons required

• Fossil fuels are limited / wind energy, etc. is not limited
or issues relating to pollution
or environmentally friendly, etc.

23. Identify clearly the position of pins 1 and 8 on the chip shown.



Pins must be clearly identified

24. State **one** advantage and **one** disadvantage of food additives.



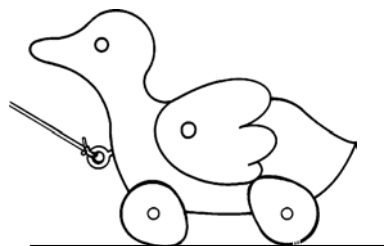
Advantage: • 1 valid advantage (2 marks)

Enhance flavour (msg)/colour
or Health ie vitamins added
or preservatives, etc.

Disadvantage: • 1 valid disadvantage (2 marks)

Reaction to additive (allergy/hyperative)
or longterm health effect unknown, etc.

25. State **two** reasons for a final evaluation as part of the design process.

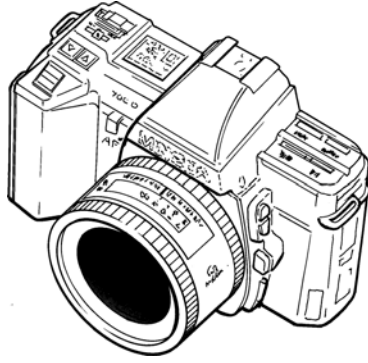


(i): (2 x 2 marks)

(ii): • Check product against design brief (specifications)

or ensure (toy) is safe/working
or identify possible improvements, etc.

26. State **two** ways in which technology has changed the way images are recorded.



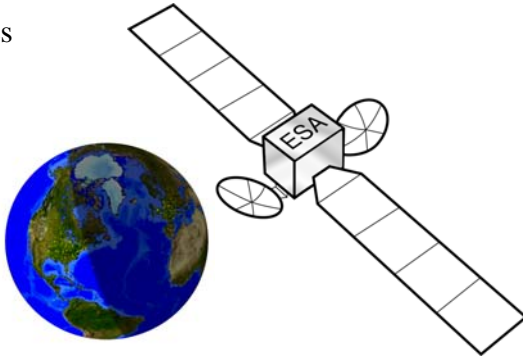
(i): (2 x 2 marks)

(ii):

- replacement for film by CCD/digital recording

or storage of image on flash card, etc.
or download image to computer/printer, etc.

27. Give **two** uses of satellites.



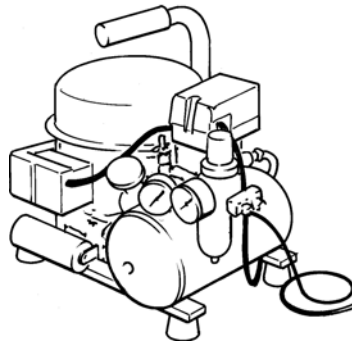
(i): (2 x 2 marks)

(ii):

- Communications (phone/tv/radio)

or imaging (weather/survey/military/space)
or GPS
 etc.

28. State **two** uses of pneumatic power.



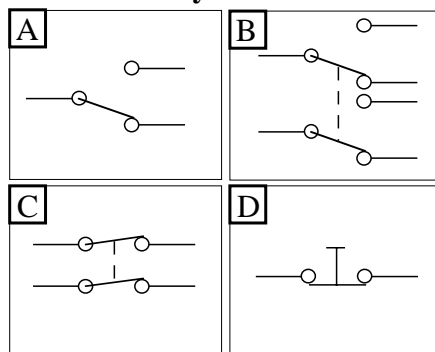
(i): (2 x 2 marks)

(ii):

- Operating (providing motive power) for machinery

or Spraypainting
or Lifting jack
or Inflating tyres/opening wheel nuts
or Bus doors, brakes
 etc.

29. Match the switch names given with the correct symbol.



Switch Names

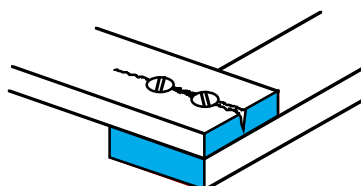
Push to Break: • D (1 mark)

Single Pole Double Throw: • A (1 mark)

Double Pole Double Throw: • B (1 mark)

Double Pole Single Throw: • C (1 mark)

30. Suggest **two** ways of reducing the risk of the wood splitting in the joint shown.



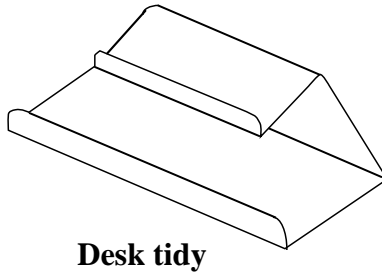
(i): (2 x 2 marks)

(ii):

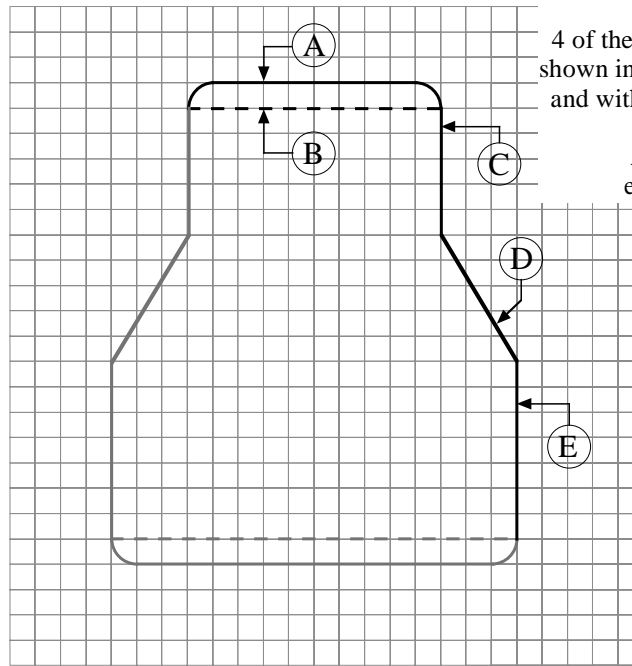
- Pre-drill screw holes

or Stagger screw positions
or Pilot holes/Smaller screws
or Alternative joining method stated
 etc.

31. Complete the development of the desk tidy shown including all bend lines.



Desk tidy



Development

• (4 x 1 marks)

4 of the development lines shown in the correct location and with the correct length

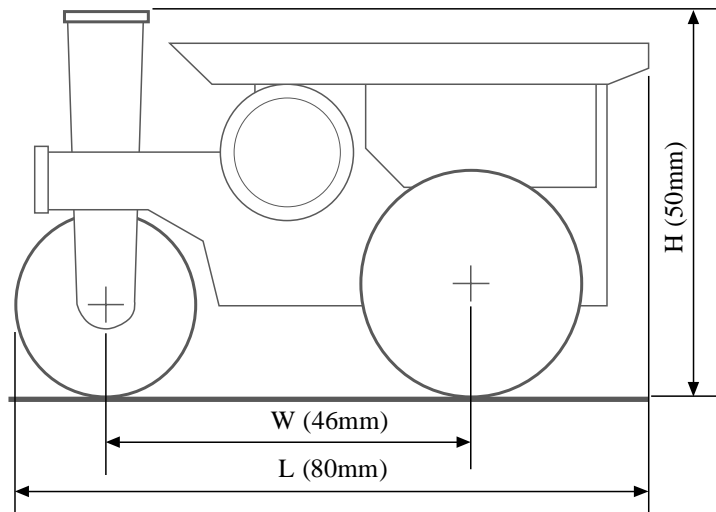
A, B, C and either D or E

32. Clearly dimension the sketch of the toy to indicate:

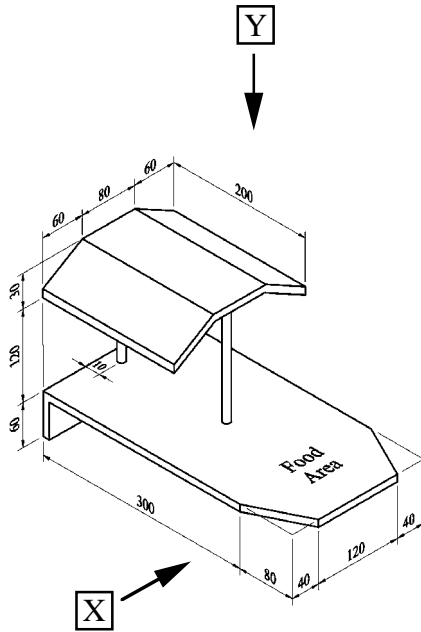
- (i) the overall height,
- (ii) the overall length,
- (iii) the distance between the wheel centers.

The sketch is shown full size.

- 1st dimension (2 marks)
 - 2nd dimension (1 mark)
 - 3rd dimension (1 mark)
- Acceptable method of representation

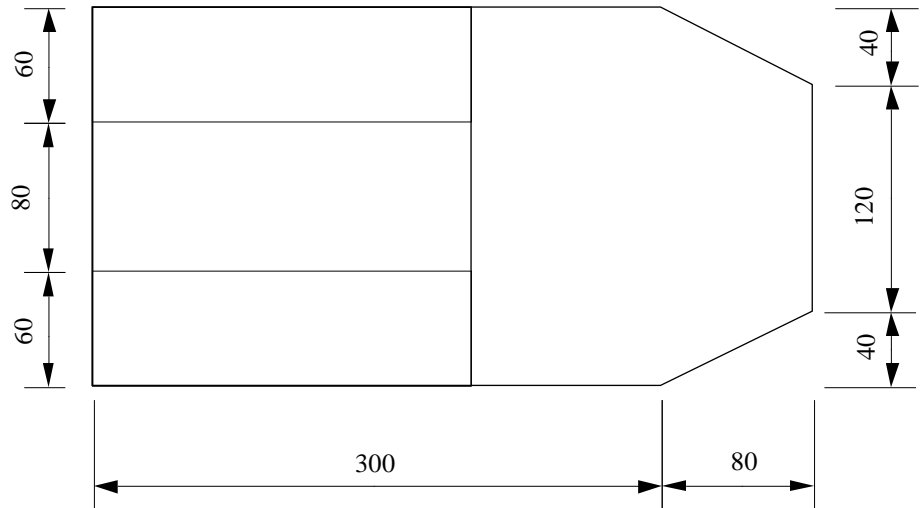
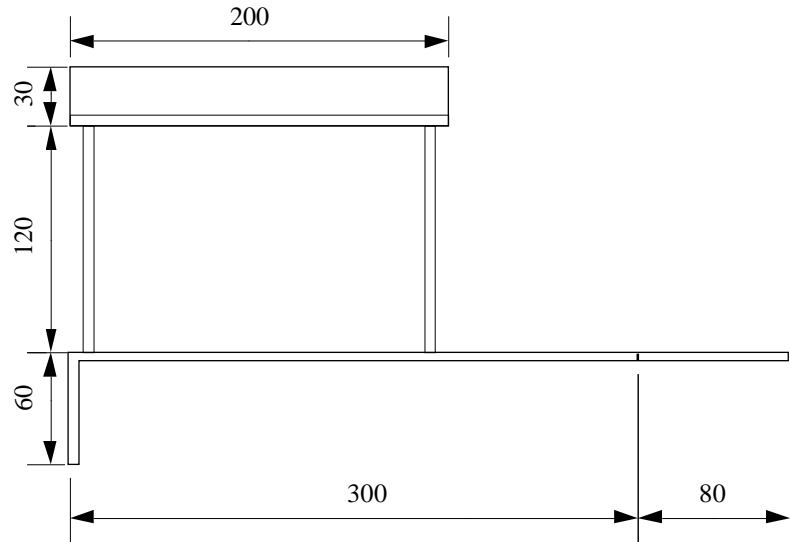


- 1 (a) The sketch shows a design for a bird table.



All dimensions are in millimetres

Note : Thickness of material and roof support (dowels) not given.

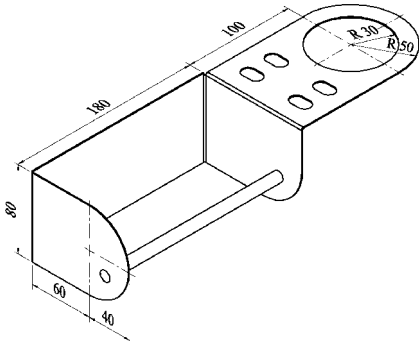


- (i) Using a suitable scale draw:
1. An **elevation** when looking in the direction of arrow 'X'. 5 marks
 2. A **plan view** when looking in the direction of arrow 'Y'. 5 marks
- **Correct view elevation : 2 marks, Correct view plan : 2 marks.**
 - **All elevation proportions correct: 3 marks., All plan proportions correct: 3 marks.**
-1 mark for each incorrect dimension to max. of 3 in both elevation and plan .
- (ii)
1. Suggest a **suitable material** from which the roof could be made and give **two reasons** for your selection. 1,2,2 marks
- **Suitable material: 1 mark, 1st valid reason: 2 marks, 2nd valid reason: 2 marks.**
2. Describe, with the aid of sketches, the steps required to attach the roof to the vertical dowels shown. 5 marks
- **Satisfactory sketches: 5 marks. Sliding scale 1-5.**
- (iii) It was found that food fell off the table when the birds were feeding. Sketch a suitable design modification to solve this problem. 5 marks

- **Satisfactory sketches: 3 marks. Sliding scale 1-3.**
- **Suitable design: 2 marks**

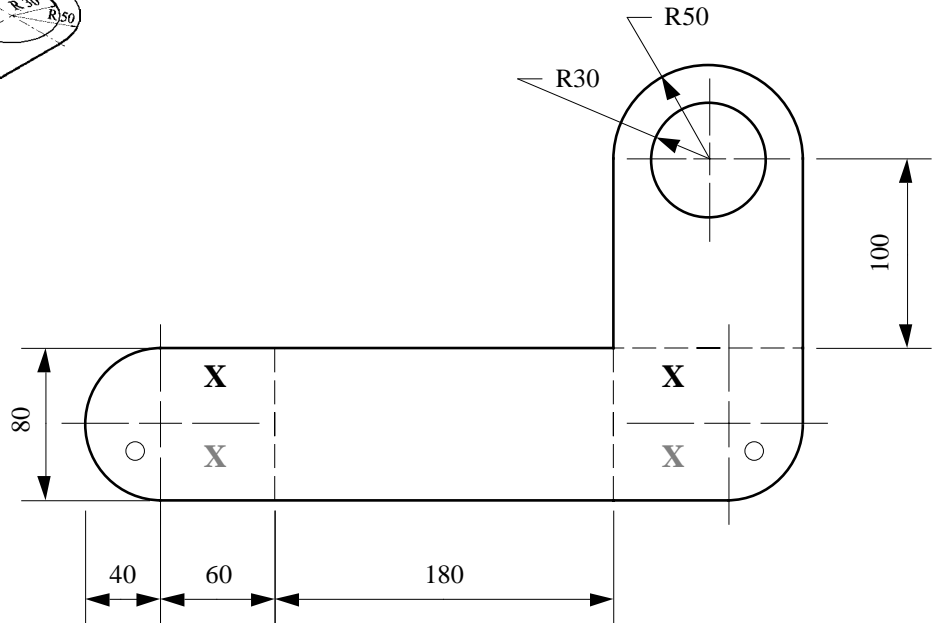
- OR -

- 1 (b) The sketch shows a design for a bathroom fitting.
The fitting is designed to hold a drinking glass, four tooth brushes and a face cloth.



All dimensions are in millimetres

Note: toothbrush holes not required on development



- (i) Using a suitable scale, draw a development of the bathroom fitting. 5,2 marks
3 marks

- **Correct development: 5 marks.**
 - 4 panels in correct position: 4 x 1 marks
 - hole for glass in correct position : 1 mark
- **Drawn to scale (correct proportions): 2 marks.**
- **3 bend lines shown in correct position: 3 x 1marks.**

- (ii) 1. Suggest a **suitable material** from which the fitting could be made and give **two reasons** for your selection. 2 marks
2 marks

- **Suitable material: 2 marks.**
 - Acrylic / metal
- **2 satisfactory reasons: 2 x 1 marks.**
 - easily shaped / water resistant / easily cleaned / hygenic, etc.

2. Explain **why** it is necessary to **drill the holes** before bending. 2 marks

- **Satisfactory explanation: 2 marks.**
 - Difficult to align/markout/drill after bending

3. Describe **how to produce the large hole** for the drinking glass. 4 marks

- **Satisfactory description: 4 marks. (sliding scale 1-4)**

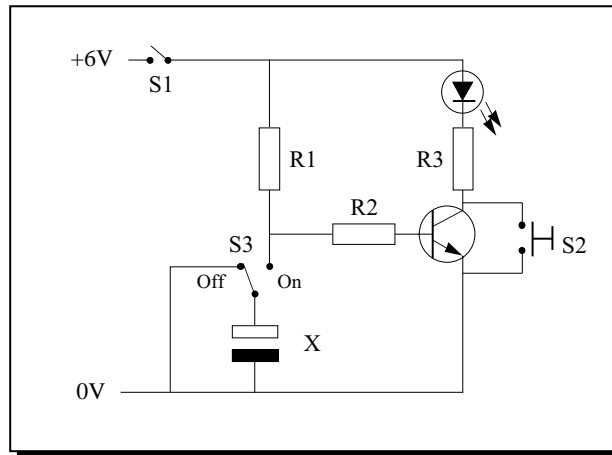
- (iii) 1. Describe how the face cloth rail could be attached to the fitting.

- **Satisfactory description: 3 marks. (sliding scale 1-3)**

2. Another rail is required for a second face cloth.
Indicate clearly on your development where the second rail could be attached. 2 marks

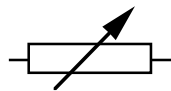
- **2 correct positions indicated: 2 x 1 marks. ('X's as shown)**

2 (a) The sketch shows a design for a time delay circuit.



Colour	Value
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Grey	8
White	9

- (i)
- Name component 'X' in the circuit.
 - 'X' = **capacitor**: 2 marks.
 - If switch S1 is in the 'on' position, explain what happens to component 'X' when switch S3 is :
 - turned to the 'on' position,
 - **Capacitor will charge**: 1 mark.
 - turned to the 'off' position.
 - **Capacitor will discharge**: 1 mark.
 - State **two ways** in which the length of the time delay can be increased.
 - **1st Increase value of 'X'**
 - **2nd increase value of R1:**
 - 1st correct: 2 marks.
 - 2nd correct: 1 mark.
 - Name and sketch the symbol for a component which will provide a variable time delay.

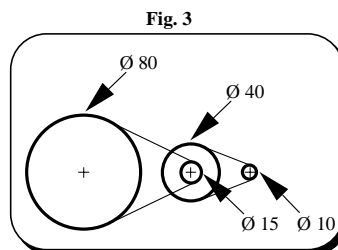
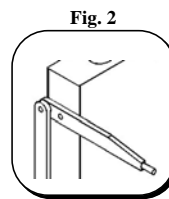
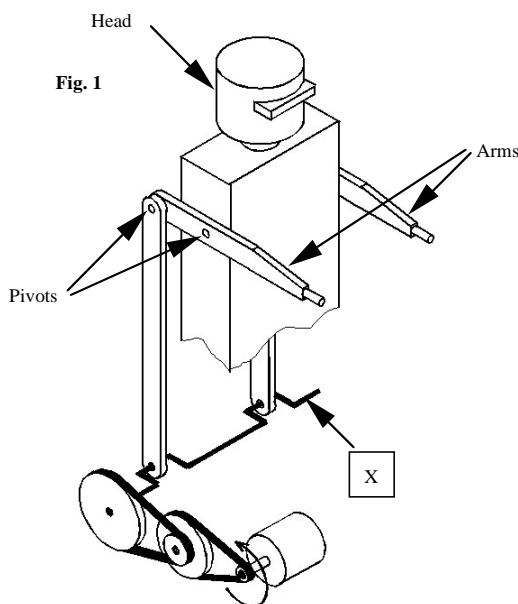


- **Component name = Variable resistor**: 1 mark.
- **Sketch of component** : 2 marks.

- (ii)
- What is the function in the circuit of:
 - switch S1,
 - **(Master) On/Off switch**: 2 marks.
 - switch S2?
 - **Test LED is working or power is 'ON'** : 2 marks
 - Explain how the negative terminal of the LED can be identified on the component.
 - **Short leg or bevel**: 3 marks.
 - Suggest a practical application for the circuit shown.
 - **Valid application**: 3 marks.
- (iii)
- Explain the purpose of resistor R3 in the circuit.
 - **Protect LED**: 1 marks.
 - Resistor R3 has a value of $330\Omega, \pm 5\%$. State the colours of **all** bands on this resistor.
 - **1st colour: Orange** 1 mark.
 - **2nd colour: Orange** 1 mark.
 - **3rd colour: Brown** 1 mark.
 - **$\pm 5\%$: Gold** 1 mark.

- OR -

2 (b) The sketch shows an outline design for a child's toy.

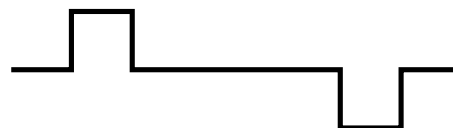


(i) 1. Name component 'X' as shown in Fig. 1, and briefly explain its function in the design.

• **'X' = Crank** 2 marks
 • **Function:**
 - Cause arms to move 1 mark
 - in unison/up & down 1 mark

2. Re-draw the component 'X' in order to create alternate movement in the arms i.e. one arm moves up as the other moves down.

• **Satisfactory sketch:** 3 marks.



3. If the distance between the pivots is reduced, as shown in Fig. 2, what effect will this have on the movement of the arms?



• **Effect described:** 3 marks.
 - Angle through which arms move increases

(ii) 1. If the motor turns at 1600 RPM; calculate the output speed for the pulley system shown in Fig. 3.

• **Speed: 75(rpm)** 6 marks.

• $1600\text{rpm} \times \text{Ø}10 = \text{'A'}\text{rpm} \times \text{Ø}40 \Rightarrow \text{'A'} = 400\text{rpm}$ 3 marks
 • $400\text{rpm} \times \text{Ø}15 = \text{'B'}\text{rpm} \times \text{Ø}80 \Rightarrow \text{'B'} = 75\text{rpm}$ 3 marks

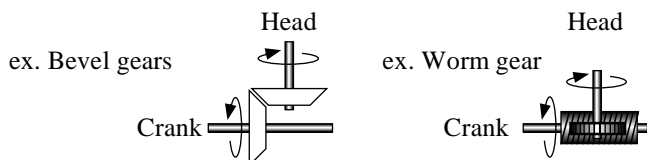
formula with correct values inserted but calculated ans incorrect : allow 2 mark
 formula only allow: 1 mark ie $S1 \times D1 = S2 \times D2$

2. State **one** advantage and **one** disadvantage of pulley drive systems over gear drive systems.

• **Advantage:** 2 marks.
 • **Disadvantage:** 2 marks.

Adv: Quieter, less tolerance required, can slip if resistance encountered, cost, etc.
 Disadv.: Belt can break/wear, can slip if under load, etc.

(iii) Sketch a mechanism which will cause the head to rotate as the arms move up and down.



• **Valid mechanism** 1 mark
 • **Location correct** 1 mark
 • **Mechanism sketched:** 3 marks.
 (1-3)

Section C - 50 Marks

Answer **one** question from this section - all questions carry equal marks.

This section relates to **Technology & Society, Design & Manufacture and Control Systems.**

3. *Technology and Society*



A modern shopping centre depends on new technologies for everyday operations.

- (a) (i) *Explain, using **two** suitable examples, where modern technologies are used in maintaining security in a shopping centre.*

- **2 suitable examples - Cameras, Security tags, etc.**
[stated example 2 mks, explained 3 mks (1-3)]

(2 x 5 marks)

- (ii) *Explain, using **two** examples, how modern technologies are used to extend the shelf life of food products in a supermarket.*

- **2 suitable examples - UHT, Irradiation, etc.**
[stated example 2 mks, explained 3 mks (1-3)]

(2 x 5 marks)

- (iii) *Explain, using **two** suitable example, the role of modern electronic technologies in the operation of a supermarket.*

- **2 suitable examples - Barcode scanning, stockcontrol etc.**
[stated example 2 mks, explained 3 mks (1-3)]

(2 x 5 marks)

- (b) *Many consumer products are stated to be 'ozone friendly', 'recyclable' or 'biodegradable'. Explain the meaning of any **two** of these terms.*

- **Any 2 explained -**

(2 x 5 marks)
(sliding scale)

Ozone friendly : product does not contain chemicals which will damage the ozone layer

Recyclable: product/part of product (package) can be recycled

Biodegradable: product/part of product (package) can be broken down biologically in a 'short' time.

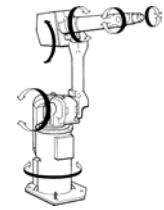
- (c) *'When examining the operation of a modern high tech shopping centre, the gap between First and Third World countries becomes very obvious'. Explain, using **two** suitable examples, the meaning of this statement.*

- **2 suitable examples -**
[stated example 2 mks, explained 3 mks (1-3)]

(2 x 5 marks)

High tech nature of First world, Range of products sourced by First world, Facilities available (Internet shopping/home delivery) etc.
Any valid answer emphasising technological difference.

4. Control Systems & Technology and Society



Many modern manufacturing plants use Computer Aided Manufacturing (CAM) systems.

(a) (i) Explain the term CAM and state **two** advantages of this system over traditional systems.

- **CAM explained :- Computer controlled machine used in manufacture (5 marks)**
- **2 advantages (2 x 5 marks)**
 - Any valid advantage emphasising difference between 'manual' and 'machine' manufacture : accuracy, reproducible, 'operate' for longer, etc.

(ii) Many CAM mechanisms use a feedback system. Explain the meaning of 'feedback' and explain its importance in CAM.

- **Feedback explained : (5 marks)**
 - Signal sent back (from sensors) to controlling programme to initiate a production sequence (stop/go/reverse, etc.)
- **Importance of Feedback explained : (5 marks)**
 - Prevent manufacturing machine from going beyond required operation
 - Used by controlling programme to determine location of machine tool, etc.

(iii) The robotic arm shown is designed with many axes of movement. Explain why this is necessary in a robotic arm.

- **Suitable explanation (5 marks)**
 - Permits arm to move through a wide range of angles/positions, etc.
 - Provides flexibility in the arm to use a wide range of tools, etc.

(b) (i) Many modern low cost consumer electronic products are 'disposable'. Explain the term 'disposable'.

- **Suitable explanation of 'Disposable' (5 marks)**
 - Product designed to be 'thrown away' if fault develops, etc.
 - Product can not be serviced/repaired, etc.

(ii) State **one** advantage and **one** disadvantage of using such disposable products.

- **1 advantages (5 marks)**
 - Any valid advantage : low cost, mass produced, etc.
- **1 disadvantages (5 marks)**
 - Any valid disadvantage : dedicated components , waste of resources, etc.

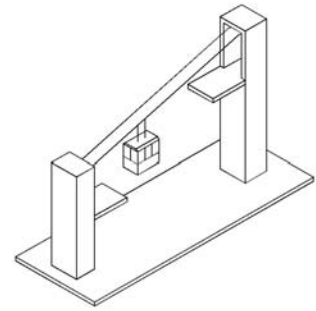
(iii) Outline a means of managing the appropriate disposal of electronic products.

- **1 method of management (5 marks)**
 - Any valid method: break up and recycle, battery bins, require manufacturers to avoid using 'disposable' components, etc.

(sliding scale)

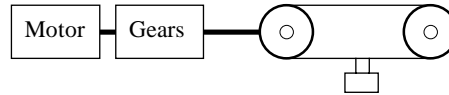
5. **Design and Manufacture.**

The sketch shows a design for a model cable car system.



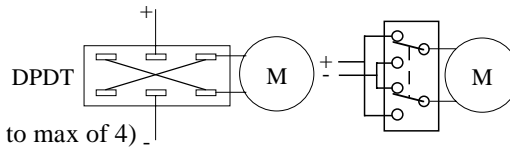
- (a) (i) Using notes and sketches show a suitable mechanism which will drive the cable car slowly in both directions.

- **Sketches (satisfactory mechanism - pulley, etc.)** (6 marks)
- **Notes (satisfactory notes)** (2 marks)



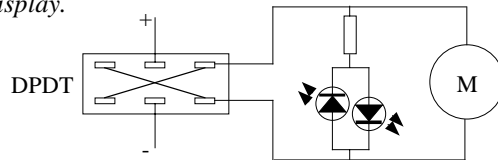
- (ii) Sketch a suitable circuit which will allow stop, forward and reverse control of the mechanism from a 9V battery.

- **Circuit sketch** (6 marks)
 - DPDT identified : 2 marks
 - Wired correctly : 4 marks
 - (-1mk for each incorrect connection to max of 4)



- (iii) Sketch a suitable addition to the circuit which will show the direction of travel on an LED display.

- **Circuit sketch** (6 marks)
 - 2 x LEDs identified : 2 marks
 - Wired correctly : 4 marks
 - (-1mk for each incorrect connection to max of 4)



- (b) (i) Sketch a design for a suitable open frame pylon structure to replace the towers shown.

- **Sketches (satisfactory frame structure - cross members, etc.)** (4 marks)

- (ii) Two bridge structures are shown.



Using a sketch of the bridges, indicate where structural forces are operating and identify the members used to withstand these forces.

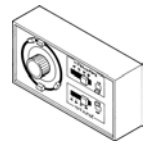
- **Location of bending force identified in each case** (2 x 2 marks)
- **Location of resistive force identified in each case** (2 x 2 marks)

- (iii) Name two other structures where open frames are used and state two advantages of these structures over solid structures.

- **2 open frame structures named - cranes, tents, ESB pylons, etc.** (2 x 2 marks)
- **2 advantages stated - less material, less pressure on base, cost, etc.** (2 x 2 marks)

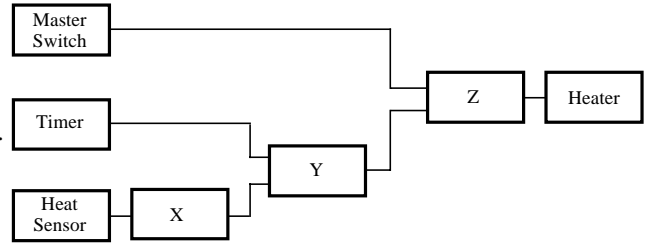
- (c) Wood and metal are materials frequently used in the construction of pylons. State one advantage and one disadvantage of using each material.

- **1 advantage wood : 3 marks, 1 disadvantage wood : 2 marks** (2 + 3 marks)
- **1 advantage metal : 3 marks, 1 disadvantage metal : 2 marks** (2 + 3 marks)



A student's design for a system to control a heater is shown as a block diagram.

The heating system must operate if the temperature is low and the timer is on.
 The timer produces a logic state of '1' when active.
 The heat sensor produces a logic state of '0' when it is cold.
 The system can be turned on at any stage with a master switch.



(a) (i) Identify the logic gates which should be used at 'X', 'Y' and 'Z' in this system.

- **X = NOT, Y = AND, Z = OR** (3 x 4 marks)

(ii) Explain, using a truth table, how the logic gate 'Z' operates.

- **Truth table for OR**

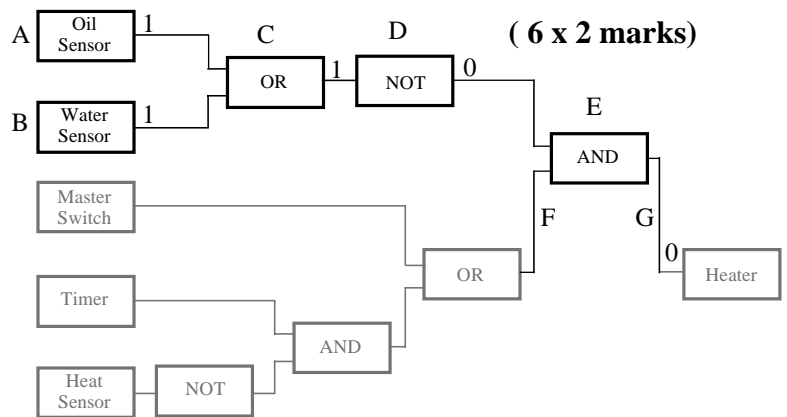
X	Y	Z
1	1	1
1	0	1
0	1	1
0	0	0

2 marks
 2 marks
 2 marks
 2 marks

(8 marks)

(b) (i) Include a modification which will automatically turn off the system if there is insufficient oil in the heating tank or low water levels are detected in the feeder tank.

- **Modification:**
 (assumes low levels = '1')
- inputs identified (A & B) (2 x 2 marks)
- gates identified (C, D & E) (3 x 2 marks)
- Connections to system (F & G) (2 x 1 marks)



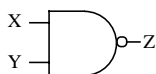
(6 x 2 marks)

(ii) Explain how this modification works.

- **Explain OR, NOT & AND gates (1st 3mks, 2nd 2mks, 3rd 2 mks.) (8 marks)**
or satisfactory explanation (Scale 1-8)

(c) Copy and complete the truth table for a NAND gate.
 (AND followed by NOT)

- **Truth table for NAND** (10 marks)



X	Y	Z
1	1	0
1	0	1
0	1	1
0	0	1

3 marks
 3 marks
 2 marks
 2 marks

- 1st & 2nd correct lines 3 marks each, 3rd & 4th correct lines 2 marks each.
 If AND gate truth table & NOT gate truth table produced as separate items and not linked - mark out of 4 & 2 [1 mk for each correct line(4) in the AND gate, 1 mk for each line in the NOT gate]. Total 6 marks only.