



# ***Technology***

## ***Higher Level***

*200 Marks*

***Wednesday, 17th June,***  
***Afternoon, 2:00 to 4:00***

### ***Section A***

#### 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

<b>For Examiner</b>	
<b>Total Mark</b>	
<b>Question</b>	<b>Mark</b>
<b>Section A</b>	
<b>Section B Q1 (a)</b>	
<b>(b)</b>	
<b>Q2 (a)</b>	
<b>(b)</b>	
<b>Section C Q3</b>	
<b>Q4</b>	
<b>Q5</b>	
<b>Q6</b>	
<b>Total</b>	
<b>Grade</b>	

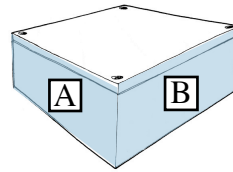
*Write your examination number in the box provided on this page*

**Section A**

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

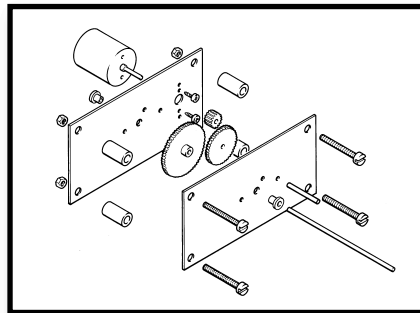
100 marks

1. Shade the container shown to suggest a light source in the given position.



Face A shaded: 2 mks  
Face B shaded: 2 mks

2. Name the type of view shown in the sketch.



View: Exploded view /  
Isometric view 4 mks

3. In relation to computers state the meaning of the following abbreviations:

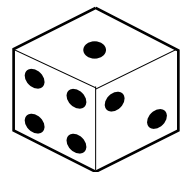
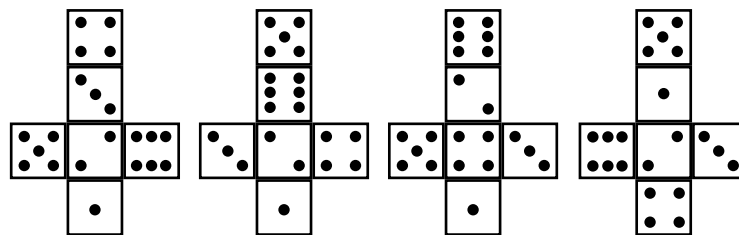
- (i) CPU
- (ii) CAD.



CPU: Central Processing Unit  
2 mks

CAD: Computer Aided Design  
2 mks

4. Which one of the developments A, B, C or D, will fold to make the dice shown?



A

B

C

D

Ans: B 4 mks

5. State the meaning of each of the symbols shown.



X

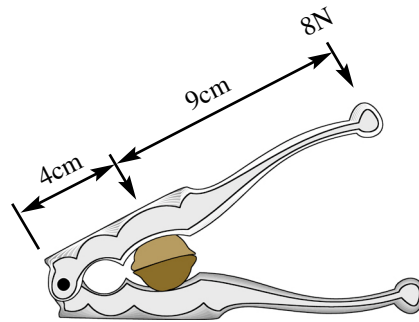


Y

X: Wear 'Face Mask/Protection'  
2 mks

Y: Wool 2 mks

6. Calculate the force applied to the nut in the nutcracker shown.



Calculation:

$[F1 \times d1 = F2 \times d2 : \text{Alt } 2 \text{ mks}]$

$8N \times (9+4)cm = XN \times 4cm : 2mks$

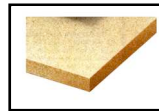
$8 \times 13 = 4X$

$26N = X : 2 \text{ mks}$

Force: 26(N)

4mks

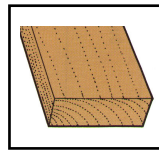
7. State **one** advantage and **one** disadvantage of MDF over natural wood.



MDF

Advantage: No knots, Uniform, Large sheets, Cost, etc.

2 mks



Natural wood

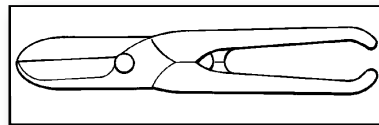
Disadvantage: No grain(features), Absorb water/expands, Dust, etc.

2 mks

8. Name the tool shown

and

name a material suitable for cutting with this tool.



Tool: Snips

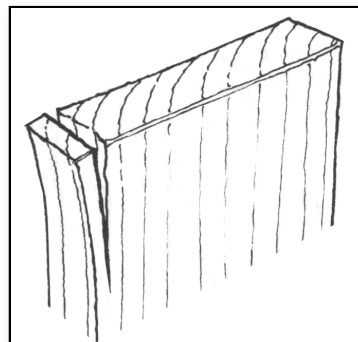
2mks

Material: Metal sheet/wire

2mks

[Plastic = 0]

9. State briefly how the end grain split can be prevented when planing wood.

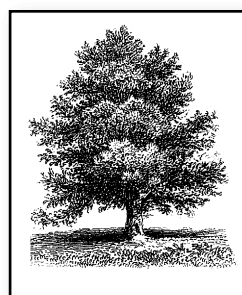


Answer: Satisfactory ans. 4 mks

Sketch or describe:

Place waste wood against end of piece, plane towards centre, with grain,

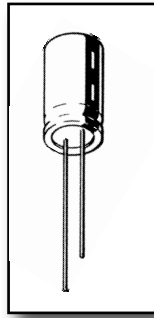
10. Indicate clearly in the table shown, if each named wood is a hardwood or a softwood.



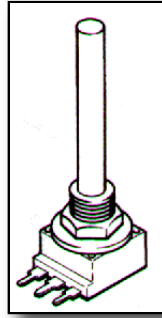
Wood	Hardwood	Softwood
Oak	H	
Teak	H	
Beech	H	
Pine		S

4 x 1 mk = 4 mks

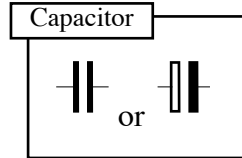
11. Sketch the electronic symbol for each component shown.



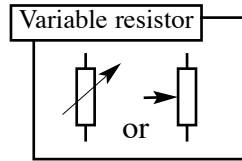
Capacitor



Variable resistor

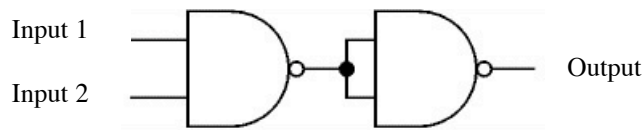


2 mks



2 mks

12. Complete the truth table for the NAND gate combination shown.

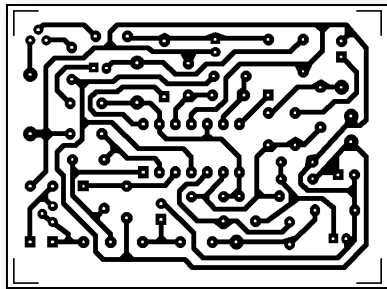


Truth Table

Input 1	Input 2	Output
1	1	0
1	0	1
0	1	1
0	0	1

4 x 1 mk = 4 mks

13. State **two** advantages of using a printed circuit board in a circuit.



(i): \_\_\_\_\_ 2 x 2mks

Fast circuit construction,  
less errors, cost effective,  
same design in many projects, etc.

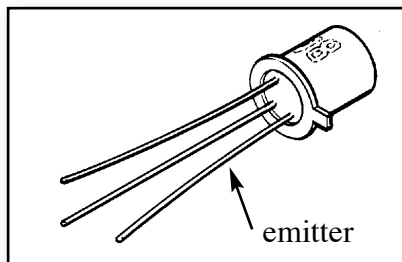
(ii): \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

14. Indicate clearly how the **emitter** can be identified on the transistor shown.

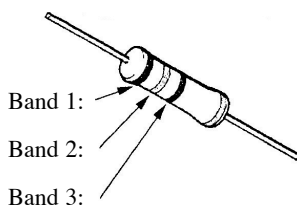


Answer: *describe / show* 4 mks

Leg close to tab,  
mark leg / indicate on sketch

\_\_\_\_\_

15. Using the colour code table shown, state the value of resistors A and B.



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

	Band 1	Band 2	Band 3	Value
Resistor A	Brown	Black	Red	<u>10 00</u>
Resistor B	Orange	Orange	Brown	<u>33 0</u>

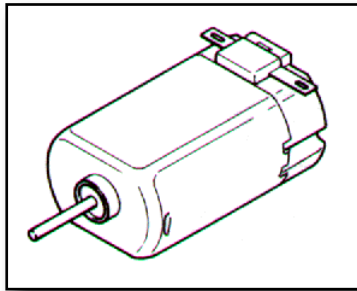
4 x 1 mk = 4 mks

16. Name the mechanism shown which will produce an oscillating motion in the toy caterpillar.



Mechanism: CAM (2 mks) & Follower (2 mks)

17. Name **two** energy conversions which take place when an electric current is applied to the motor shown.



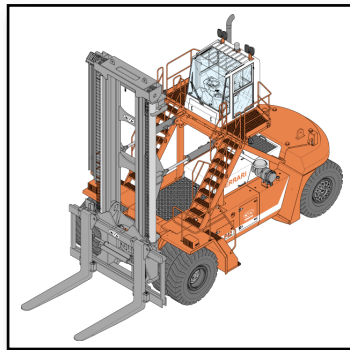
From: Electrical 1 mk

To: Kinetic 1 mk

From: Electrical 1 mk

To: Sound/Heat/Light 1 mk

18. State **two** reasons why a chain is used in preference to a belt in a forklift hoist.



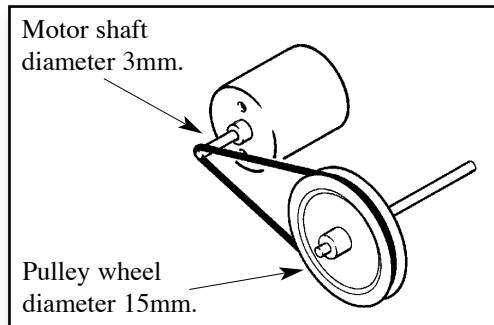
(i): 2 x 2 mks

Will not slip, stretch, break under load. Will last longer, Stronger, etc.

(ii): \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

19. If the motor shaft turns at 90RPM calculate the speed of rotation of the pulley shaft.



Calculation:

$[D1 \times S1 = D2 \times S2 : \text{Alt } 2 \text{ mks}]$

$3\text{mm} \times 90\text{RPM} = X\text{RPM} \times 15\text{mm} : 2\text{mks}$

$3 \times 90 = 15X$

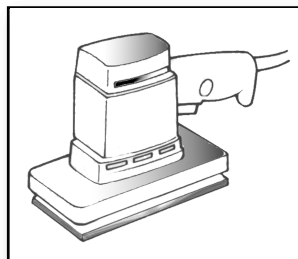
$18\text{RPM} = X : 2 \text{ mks}$

Speed: 18 (RPM)

4 mks

\_\_\_\_\_

20. State **two** safety precautions which must be observed when using the power tool shown.



Orbital sander

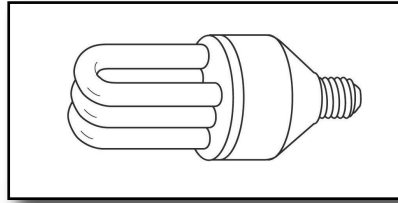
(i): 2 x 2mks

Wear protection (Face/Eye), No trailing cables, Do not use near water, No loose/broken parts, etc.

(ii): \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

21. State **two** reasons why older household bulbs should be replaced with the type of bulb shown.

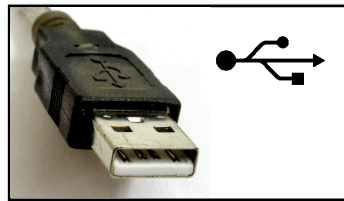


CFL bulb

(i): 2 x 2 mks  
Old bulbs not energy efficient,  
Reduce carbon footprint,  
New bulb cost effective, etc.

(ii): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

22. Name **two** USB devices which can be used with a computer.

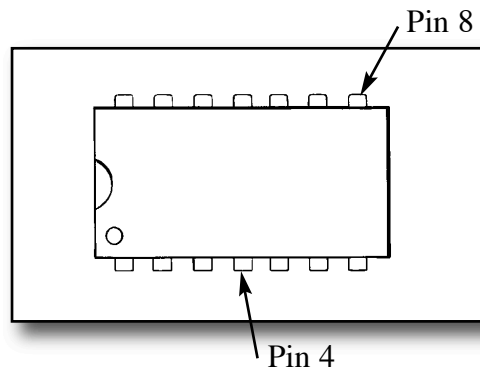


(i): 2 x 2mks  
Any two USB devices :  
Camera, Printer, Scanner, memory  
stick, HD, MP3 player, etc.

(ii): allow - toys, fans, fridges,  
lavalamps, LEDs, etc.

\_\_\_\_\_

23. Indicate clearly on the sketch the location of pins 4 and 8 on the chip shown.



Correct location  
indicated:

Pin 4: 2 mks  
Pin 8: 2 mks

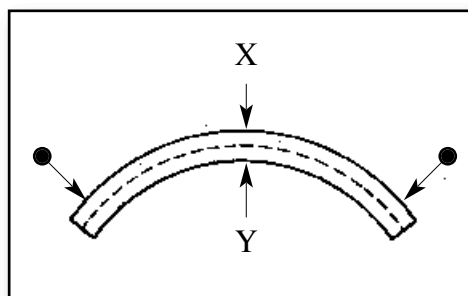
24. State **two** reasons why digital cameras are now more popular than film cameras.



(i): 2 x 2 mks  
Lower cost, faster to print,  
images can be changed, movies,  
delete images, edit image, etc.

(ii): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

25. Name the forces operating at X and at Y in the bending beam shown.



X: Tension 2 mks  
(Stretch =1)

Y: Compression 2 mks  
(Push = 1)

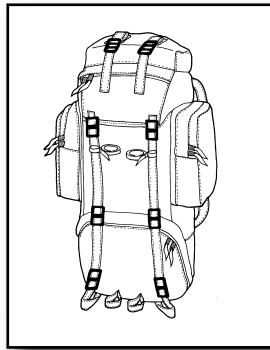
26. Name **two** technological developments which have improved computer laptop design.



(i): 2 x 2mks  
LED screen improved, Lighter,  
Track pads, battery size, HD size,  
Faster, Smaller, etc.

(ii): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

27. Indicate clearly in the table shown, if each named fabric is **natural** or **synthetic**.



<i>Fabric</i>	<i>Natural</i>	<i>Synthetic</i>
Wool	N	
Nylon		S
Polyester		S
Linen	N	

4 x 1 mk = 4 mks

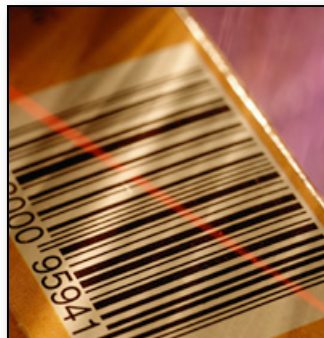
28. State **two** ways in which technology has made cars more environmentally friendly.



(i): 2 x 2 mks  
Power plant - Electric/hybrid,  
Breaking recharges battery,  
Parts recycled, etc.

(ii): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

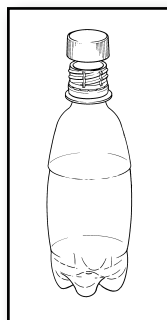
29. State **two** advantages in using laser scanners at supermarket checkouts.



(i): 2 x 2 mks  
Efficiency - faster at checkout,  
Cost effective - update price at till,  
Stock control, etc.

(ii): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

30. Explain briefly, the term **thermoplastic**.

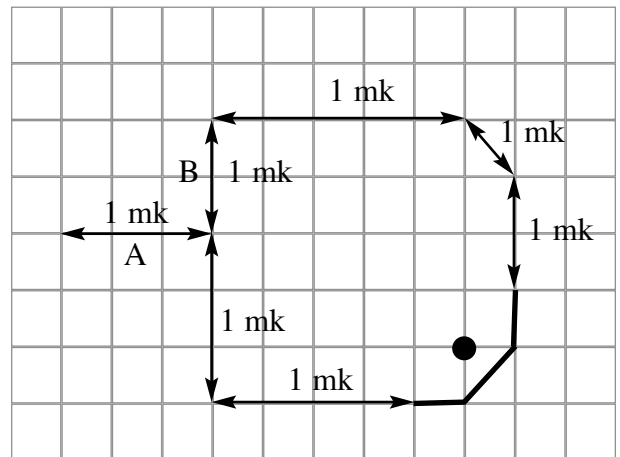
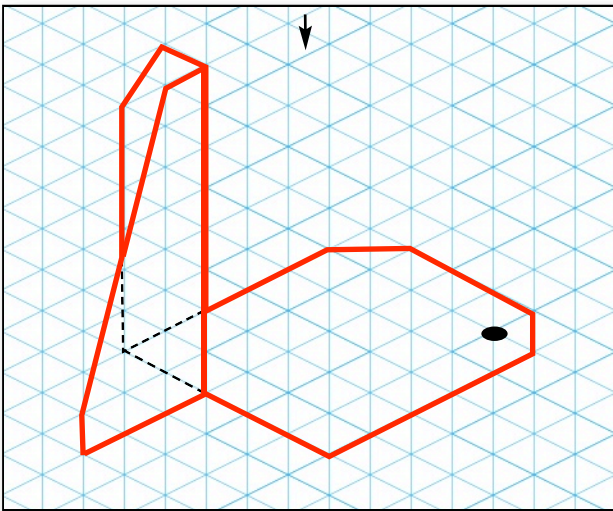


Thermoplastic: 4 mks  
Can be heated and reshaped,  
reheated.

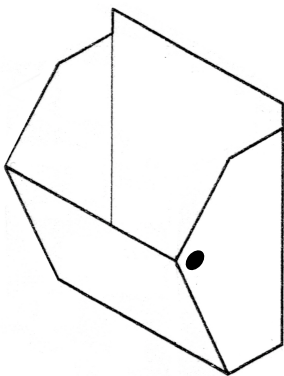
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

31. Complete the plan view of the part shown.

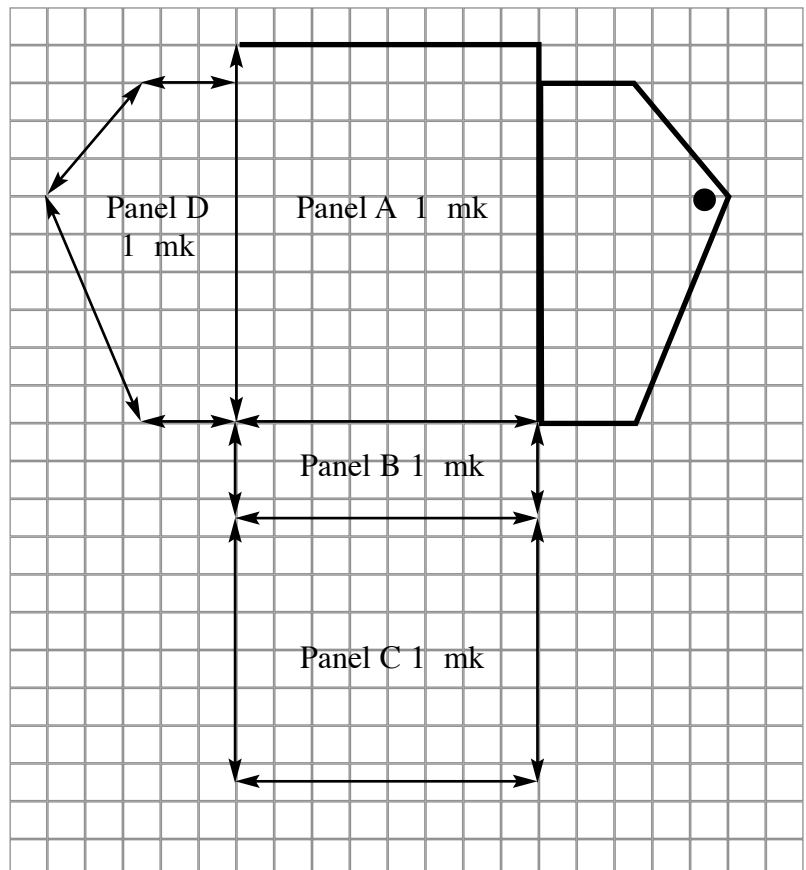
4 x 1 mks (A = 1 mk, B = 1 mk, any two other correct lines = 2 x 1 mk)



32. Complete the development of the one piece letter holder shown.

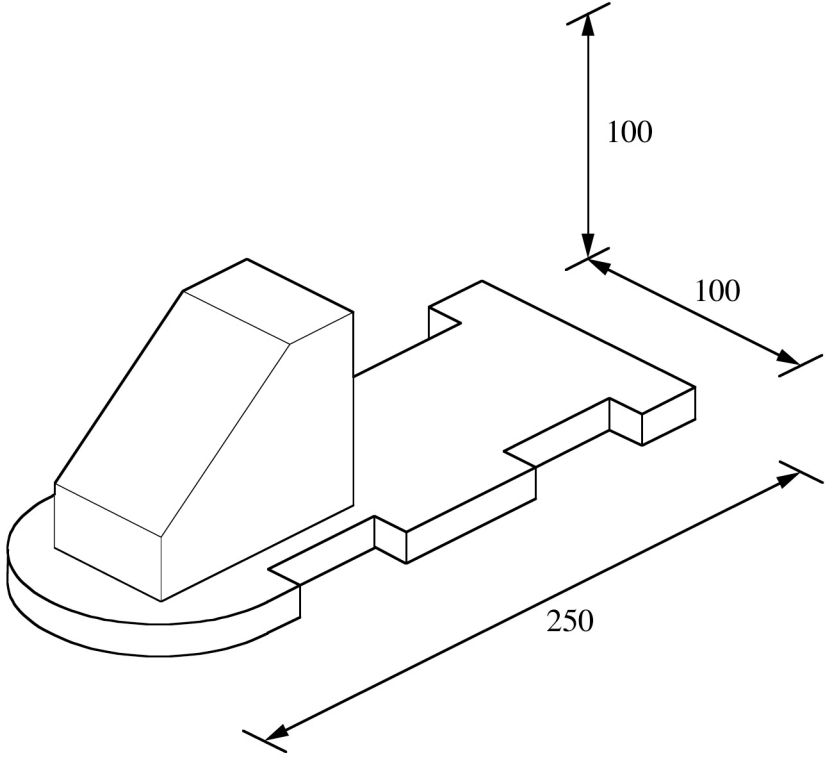


4 Panels: 4 x 1 mks

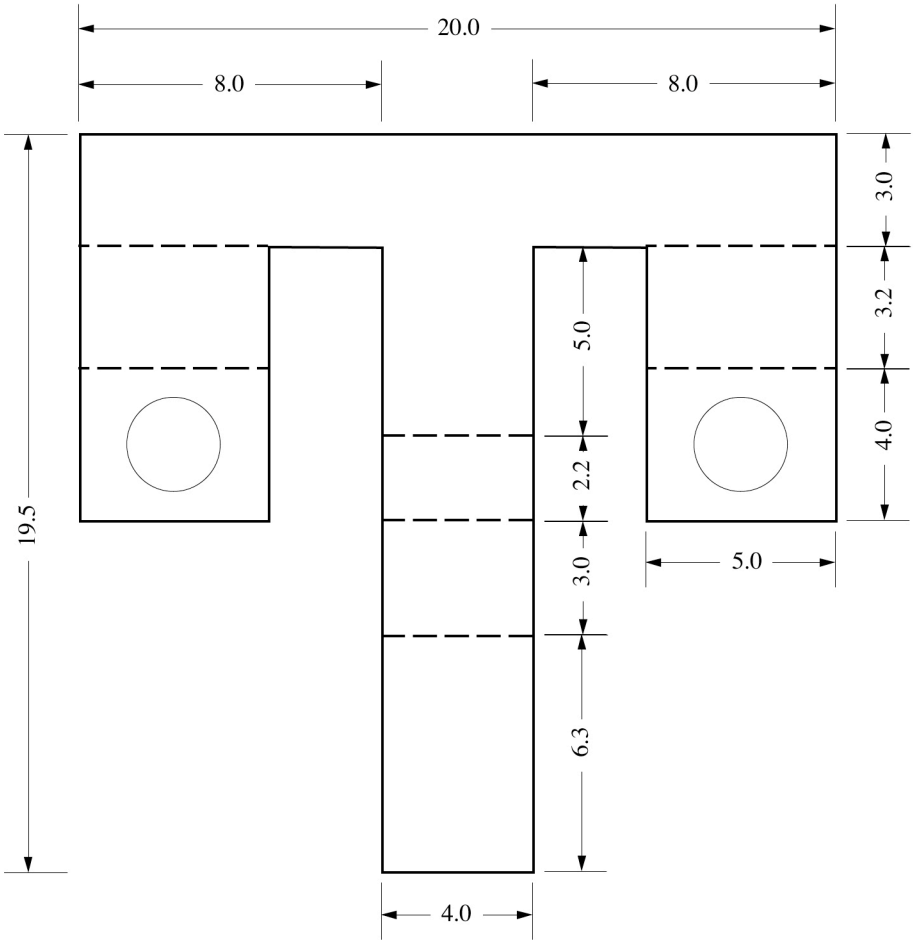




Q1a



Q1b





*Junior Certificate Examination 2009*

# ***Technology***

***Higher Level***

*200 Marks*

***Wednesday, 17th June,  
Afternoon, 2:00 to 4:00***

## ***Section B and Section C***

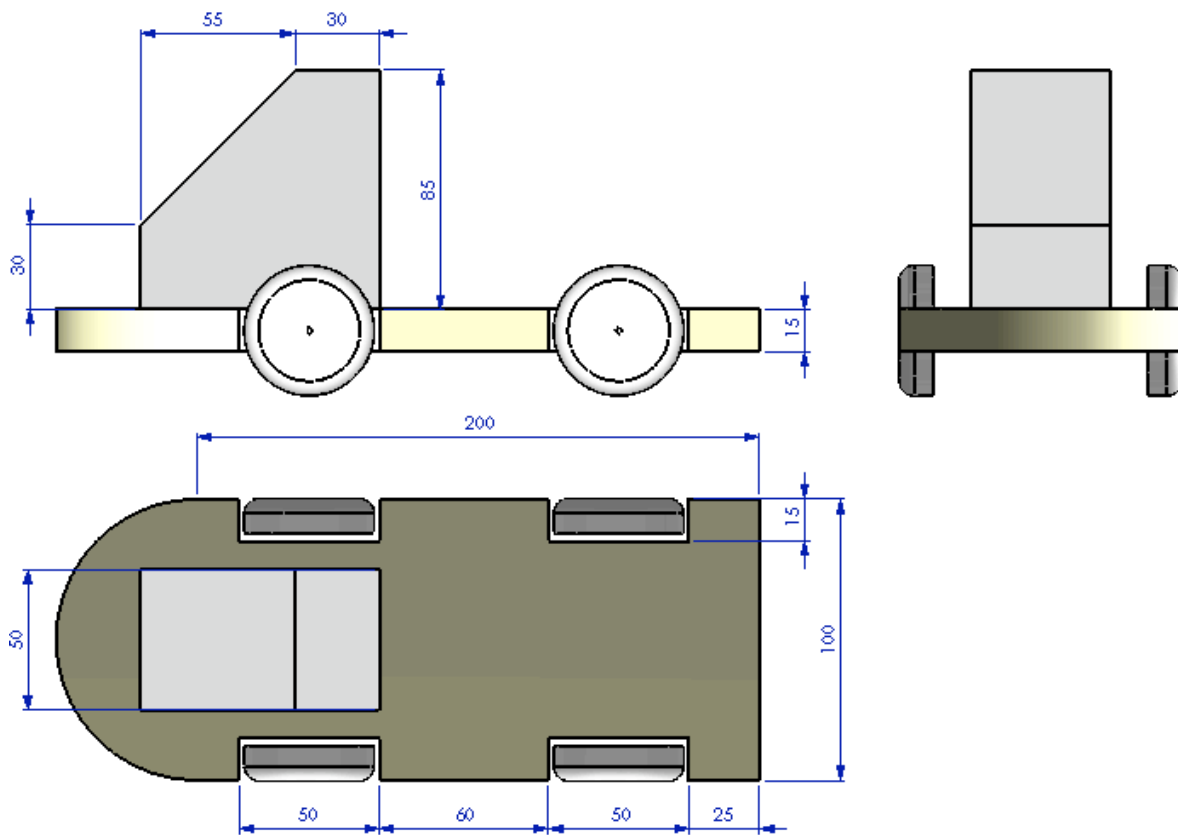
*Section B* - *50 Marks*

*Section C* - *50 Marks*

### Instructions

1. Answer either (a) or (b) from each question in **Section B**.
2. Answer one question from **Section C**.
3. Hand up **Section A** with your answer sheets to this paper.

1 (a) The sketch shows a plan, elevation and end view of a student design for a child's toy.



All dimensions are in millimeters

- (i) Sketch a well proportioned isometric view of the toy on isometric grid paper. The wheels can be omitted from the sketch. Include **three** overall dimensions on your sketch.

*Correct isometric view : 2 mks, three overall dimensions 3 x 1 mks,  
3 panels in good proportions : 2, 2, 1 mks,*

[10 marks]

- (ii) 1. Name the tools and describe the processes required to shape and finish the base of the toy from a sheet of named material of your choice.

*Named tools : 1 + 1 mks, Correct process : 2 + 1 mks*

2. Name the tools and describe the processes required to attach the wheels to the base of the toy.

*Named tools : 1 + 1 mks, Correct process : 2 + 1 mks*

[10 marks]

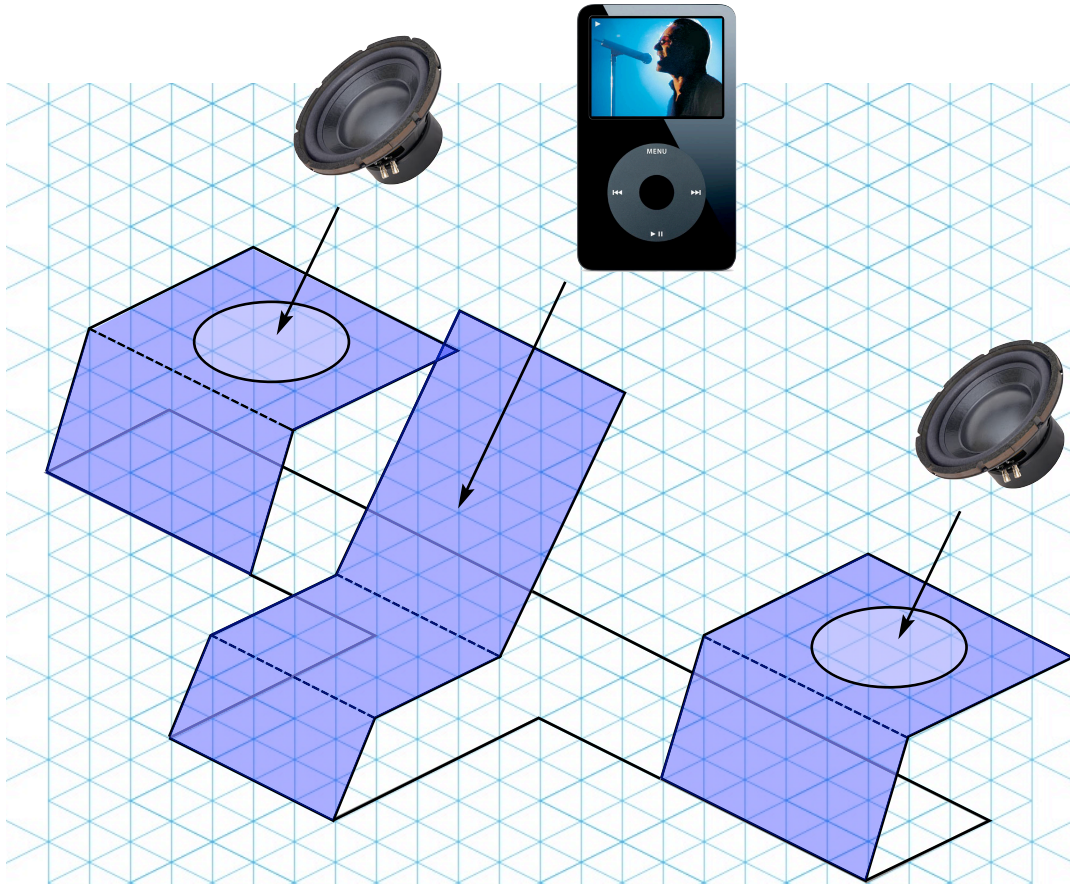
- (iii) Sketch **two** safety features which should be included in this student design.

*2 valid safety features sketched : 3 mks (1st ) + 2 mks (2nd)  
(Described only - 2 mks (1st ) + 1 mks (2nd))*

[5 marks]

- OR -

- 1 (b) The sketch shows a student design of a desktop holder for an MP3 player using recycled speakers. The holder will be manufactured from a single sheet of acrylic.



- (i) Using suitable proportions, sketch a development of the material required to manufacture the holder from a single sheet of acrylic. Indicate clearly all bend lines and show the cut outs for the speakers.

*Correct development : 5 mks, (-1 mk for each incorrect part : max -5),  
Bend lines - dotted lines (-1 mk if solid): 3 mks, Cut outs : 2 x 1 mks [10 marks]*

- (ii) 1. Name the tools and describe the processes required to form the acrylic into the shape shown.

*Named tools : 1 + 1 mks, Correct process : 2 + 1 mks*

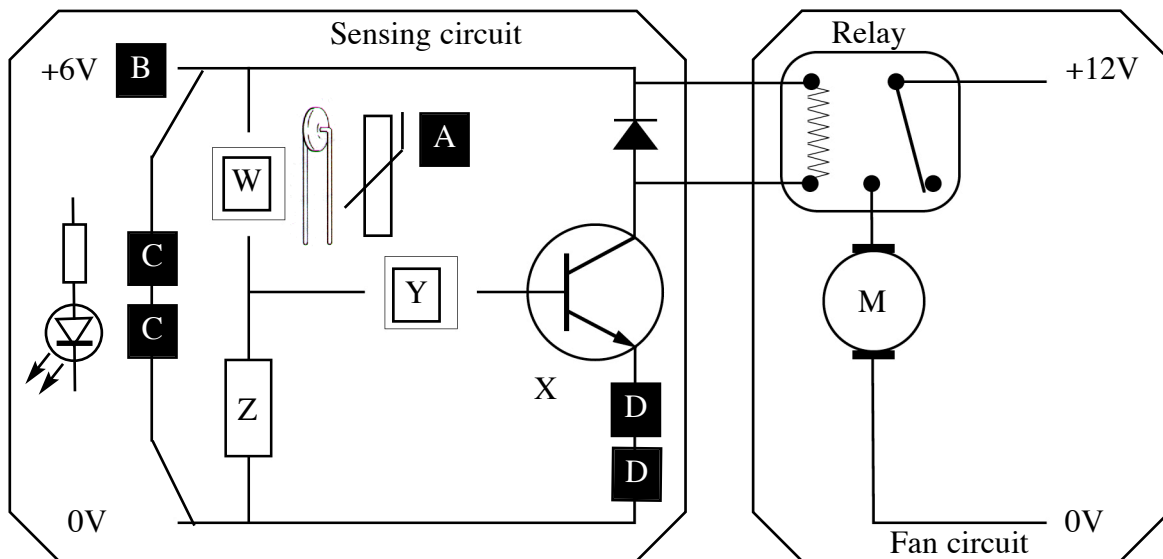
2. Name the tools and describe the processes required to produce the cut outs for the speakers in the acrylic.

*Named tools : 1 + 1 mks, Correct process : 2 + 1 mks*

3. Sketch a suitable modification to the design to prevent the MP3 player falling from the supporting platform.

*Suitable modification : 3 mks, Quality of sketch : 2 mks ( 2/1) [15 marks]*

- 2 (a) The circuit shown is designed to automatically turn on a 12V fan motor if high temperatures are detected by a sensing circuit.

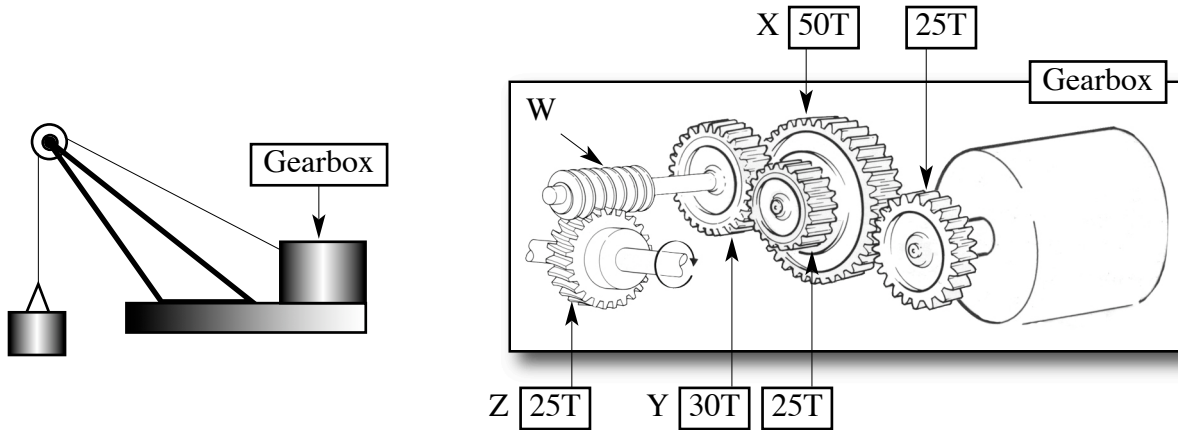


- (i)
- Sketch the electronic symbol for the thermistor 'W'.  
*Correct symbol (shown A) : 2 mks*
  - Explain the function of the transistor 'X' in the circuit.  
*Correct function : Amplify / switch : 3 mks*
  - Name the missing component required at 'Y' in the circuit.  
*Missing component : Resistor : 2 mks*
  - Resistor 'Z' has a gold fourth band.  
What information does this provide about the resistor 'Z'?  
*Tolerance : +/- 5% : 2 mks*
  - Explain why a variable resistor is a recommended replacement for resistor 'Z'.  
*Valid explanation : Set high temperature trigger level, etc. : 3 mks*
- (ii) Copy the sensing circuit diagram above into your answer book.
- Sketch a modification to the circuit to show the symbol and the most suitable location of an on/off switch for the sensing circuit.  
*Valid location of on/off switch : ex. location B : 2 mks*  
*Correct switch symbol : 2 mks*
  - Sketch a modification to the circuit to show the symbol and location of a green LED and a series resistor which will indicate that a working 6V battery is connected to the sensing circuit.  
*Correct LED symbol : 2 mks,*  
*Correct location of LED & resistor : ex. location C : 2 mks*
  - Sketch a modification to the circuit to show the symbol and location of a red LED and a series resistor which will indicate that a high temperature has been detected by the sensing circuit.  
*Correct location of LED & resistor : ex. location D : 2 mks*
  - What is the function of the series resistor in the LED circuits?  
*Function of series resistor : protect LED / reduce voltage : 3 mks*

[25 marks]

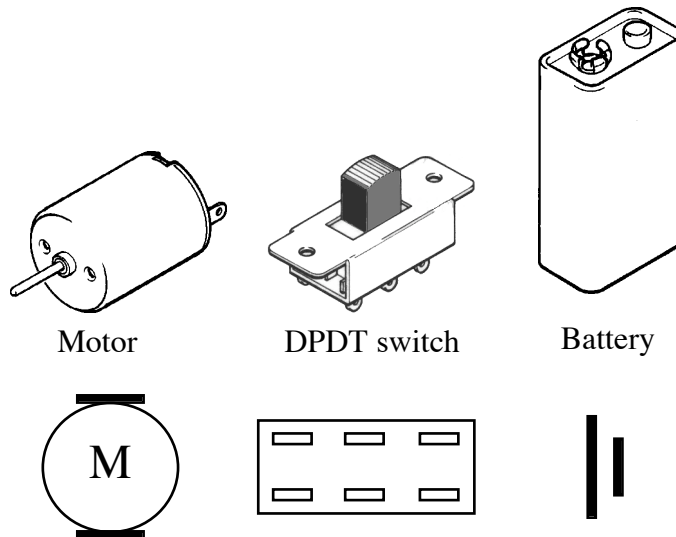
- OR -

2 (b) The sketch shows the gearbox arrangement in a lifting crane.



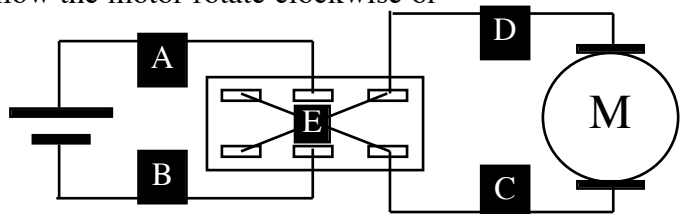
- (i)
1. Name the mechanism attached to the gear train at 'W'.  
*Mechanism : Worm : 5 mks*
  2. State **two** advantages to using mechanism 'W' in the lifting crane.  
*Two valid advantages : No slip/torque/ratio/lock : 2 x 3 mks*
  3. If the motor rotates at 600RPM calculate:
    - (i) the speed of rotation of gear X,  
 $600RPM \times 25T = 50T \times 300 RPM : 300 RPM : 3 mks$
    - (ii) the speed of rotation of gear Y,  
 $300RPM \times 25T = 30T \times 250 RPM : 250 RPM : 3 mks$
    - (iii) the speed of rotation of gear Z.  
 $250 = 25 \times 10RPM : 10 RPM : 3 mks$

[20 marks]



- (ii) Using the symbols for the motor, DPDT switch and battery, indicate how the contacts on the switch should be wired to allow the motor rotate clockwise or anticlockwise.

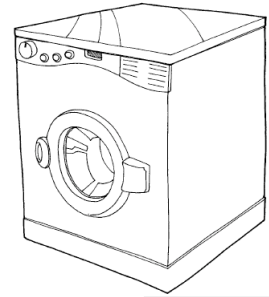
*5 correct connections  
A, B, C, D & cross over E  
5 x 1 mks*



## Section C - 50 Marks

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

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



### 3. Technology and Society

Efficient use of energy has become a concern for home owners.

- (a) (i) Describe **one** technological advance which has improved the energy efficiency of household equipment.  
*One advance named (2 mks), described (3 mks (3/2/1)):[5mks]*  
*ex. detergent operate at low temp / energy saving bulbs /*
- (ii) Describe **two** environmental concerns associated with the use of plastic components in household equipment.  
*Two concerns ( 2 x 5mks). Concern named (2 mks) described (3 mks (3/2/1)):[10mks]*  
*ex. improper disposal / not recycled - build up in environment / oil valuable resource.*
- (iii) Describe how technology can address **one** of the concerns outlined in (ii) above.  
*One concern addressed (Describe 5 mks : (5/3/1)) :[5mks]*  
*ex. manufacturer make plastic degradable / parts easily accessed - recycled, etc.*
- (iv) As consumers we are encouraged to reduce our '**carbon footprint**'.  
Explain, using suitable examples, the meaning of carbon footprint.  
*Explained (3 mks (3/2/1)), examples (2 mks):[5mks]*  
*ex. A carbon footprint relates to the amount of greenhouse gases produced in our day-to-day lives through **burning fossil fuels for : electricity, heating and transportation** (personal & product) etc.*

25 marks

Communication and entertainment products have benefited greatly from technological advances.

- (b) (i) Outline **two** advanced technologies used in these products.  
*Two technologies outlined (2 x 5 mks (5/3/1)) :[10mks]*  
*ex. GPS / WiFi / DVD / LCD screens, etc.*
- (ii) Many of these products have a short '**life-cycle**'.  
Explain, using a suitable example, the meaning of product life-cycle.  
*Explain with example (5 mks (5/3/1)) :[5mks]*  
*ex. parts wear out after a short time / cannot be upgraded / new (better) models, etc.*
- (iii) Outline, giving **two** reasons, why many of the products are regarded as **disposable**.  
*Outline two reasons (2 x 5 mks (5/3/1)) :[10mks]*  
*ex. too costly to repair / cannot be repaired because of manufacturing process, etc.*

25 marks

#### 4. Control Systems & Technology and Society



Modern entertainment robots are designed to interact with humans.

- (a) (i) Outline **two** ways in which data can be acquired by an entertainment robot.:[10mks]  
*Two data input methods outlined (2 x 5 mks (5/3/1)) ex. sound / touch / light etc.*
- (ii) Explain why the robot response to data input is limited.  
*Explain (5 mks (5/3/1)) ex. limited processing power :[5mks]*
- (iii) Explain why **software upgrades** are made available for these robotic toys. :[5mks]  
*Explain (5 mks (5/3/1)) ex. fix software errors / improve software / etc. 20 marks*

Industrial robots require **control software**, a **computer interface** and **feedback sensors**.

- (b) (i) Explain the meaning of each of the terms in **bold** above.  
*Terms explained (3 x 5 mks (5/3/1)) :[15mks]*
- (ii) State **two** advantages of using CAM in mass production.  
*Two adv. ( 3 mks + 2 mks) ex. reproducible / easily changed / speed / cost :[5mks]*
- (iii) Explain why pneumatics or hydraulics are commonly used to move industrial robotic arms instead of electric motors.  
*Explain (5 mks (5/3/1)) greater force applied / easier to fit-operate/ :[5mks]*
- (iv) Explain why robotic industrial production lines are more likely to be found in first world countries. Give **two** reasons for your answer. :[5mks]  
*Explain - 2 reasons: ( 3 mks + 2 mks) ex. labour cost / expertise / infrastructure. 30 marks*

#### 5. Design and Manufacture



A student is required to manufacture a wall mounted night light for a child's room based on the design shown.

- (a) (i) Name a suitable material for the night light and give **two** reasons for your choice.  
*Material (suitable) named (2 mks), two reasons (2 mks + 2 mks) :[6mks]*
- (ii) Describe, with the aid of suitable sketches, the steps required to manufacture the night light from the named material.  
*Describe steps (5 mks ( 3 + 2)) suitable sketched (5 mks (3 + 2)) :[10mks]*  
Name **three** processes required to manufacture the night light.  
*Three (suitable) processes named ( 3 x 3 mks):[9mks] 25 marks*
- (b) (i) Sketch a suitable 9V circuit diagram which will light a white LED in any four of the stars on the night light.  
*Correct circuit diag. (5 mks) components drawn (5 mks):[10mks]*
- (ii) Outline, with the aid of suitable sketches, a design for a novelty switch to turn the LED circuit on and off.  
*Sketch design for novelty switch (5/3/1 mks) :[5mks]*
- (iii) Describe, with the aid of suitable sketches, the steps you would take to ensure the night light and circuit are safe for use by a child.  
*Safety steps described : sketches ( 2 x 5 mks (5/3/1)) :[10mks] 25 marks*

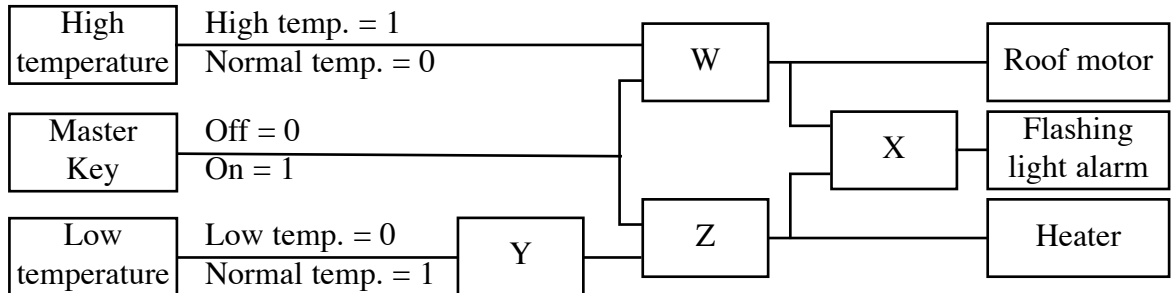
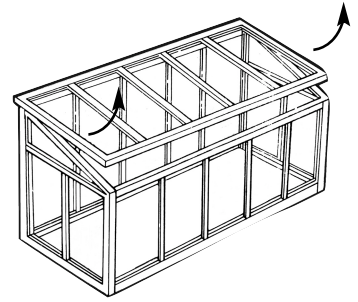


## 6. Control Systems

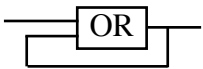
A control system is required to automatically control the temperature in a greenhouse.

The system will automatically open the roof at high temperatures and close the roof at lower temperatures. At very low temperatures the system will turn on a heater.

The system will operate only when a master switch is turned on.



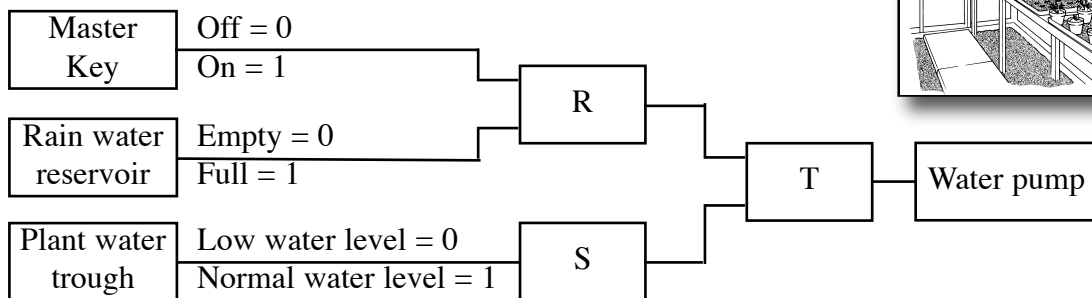
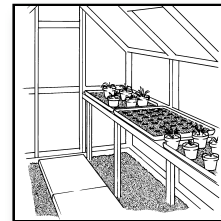
- (a) (i) Identify the logic gates required at W, X, Y and Z.  
*W: AND (3 mks), X: OR (3 mks), Y: NOT (3 mks), Z: AND (3 mks) :[12mks]*
- (ii) Sketch and complete a truth table for logic gates X and Y.  
*X: OR gate (4 mks - 4 lines), Y: NOT gate (2 x 2mks - 2 lines) :[8mks]*
- (iii) Two '**limit switches**' are required in the design of the roof opening mechanism. Explain why limit switches are required. :[3mks]  
*Explain (3 mks (3/1)) - stop motors / prevent damage to motor/gears/structure.*
- (iv) The control system requires a '**latched**' alarm system (Flashing light) for the roof mechanism and for the heater. Explain the term latch and outline how a latch can be constructed from a named logic gate. :[7mks]  
*Latch explain (3 mks) made from OR gate (2 mks) looped o/p to i/p (2 mks)*



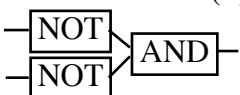
30 marks

A second system is required to automatically water potted plants in the greenhouse.

The system will pump water from a rain water reservoir to a water trough under the potted plants if low water levels are detected.



- (b) (i) Identify the logic gates required at R, S and T.  
*R: AND (3 mks), S: NOT (3 mks), T: AND (3 mks) :[9mks]*

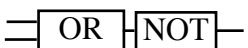


- (ii) Sketch a modification to the system shown which will activate an alarm if the reservoir and the water trough are dry.

*Valid modification sketched (6 mks (6/4/2)) :[6mks]*

Sketch a truth table for your modification.

*Truth table (5 mks) :[5mks]*



20 marks