Coimisiún na Scrúduithe Stáit
State Examinations Commission

TECHNOLOGY

Junior Certificate Examination, 2006
HIGHER LEVEL
200 Marks
Wednesday, 21st 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

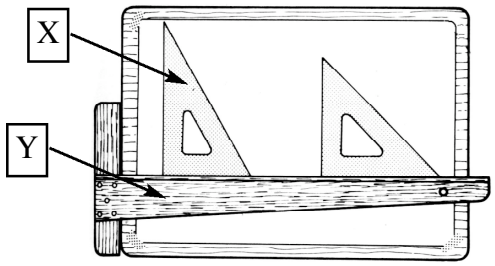
Examination Number

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

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. 25 x 4 = 100 marks

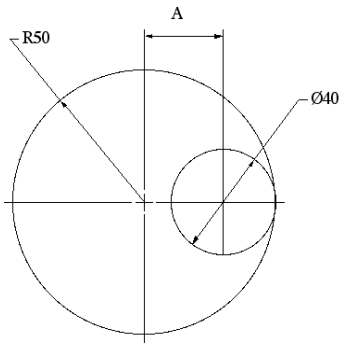
1. Name the drawing equipment shown.



X: Set Square (2 marks)

Y: T(Tee)-Square (2 marks)

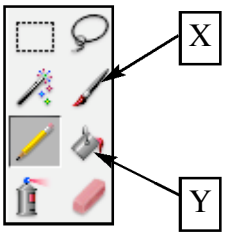
2. Calculate the value of dimension A in the drawing shown.



A: 30 (4 marks)

(R50 - $^1/_2$*40)
no units reqd.

3. Explain the function of the symbols X and Y shown found in a graphics programme menu.



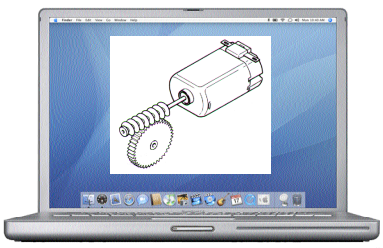
Function X: to PAINT with a colour (2 marks)

Function Y: to FILL with a colour (2 marks)

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

(i) RAM

(ii) CAD



RAM: RANDOM ACCESS MEMORY (2 marks)

CAD: COMPUTER AIDED DESIGN/DRAWING (2 marks)

5. State where each of the symbols shown are found.

X

Y

X : on Polystyrene, on Plastic, on recyclable material (2 marks)

Y : on wool, on fabric (wool) (2 marks)

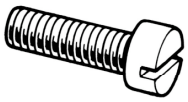
6. State **two** advantages of using plastic instead of aluminium in phone and credit cards.

Any two - (2 x 2 marks)

Advantages: Lower cost,
Easier to print to,
can be coloured,
more flexible than aluminium,
etc.

7. The sketch shows an <u>M5</u> cheese head screw.

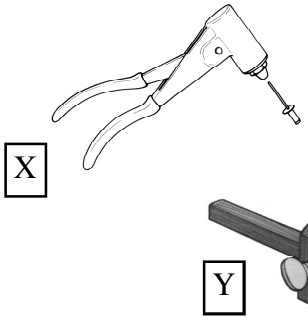
Explain the underlined term.



M: Metric (2 marks)

5: 5mm (2 marks)

8. Name the tools shown.



X: Rivet tool (2 marks)

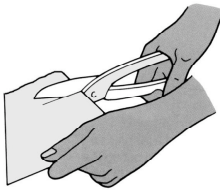
Y: Marking guage (2 marks)

9. The sketch shows a shears cutting a <u>non-ferrous</u> metal.

Explain the underlined word

and

name **one** non-ferrous metal.



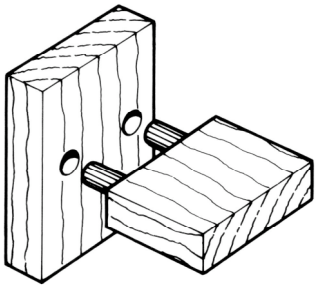
Non-ferrous: does not contain IRON
(2 marks)

Name: any one (2 marks)
Aluminium,
Copper,
Tin, etc.

10. Name the type of joint shown

and

name **one** place where this joint should be used.



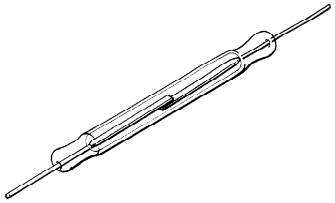
Joint: Dowel (joint)
(2 marks)

Where used: shelf, frame, etc.
(2 marks)

11. Name the type of switch shown

and

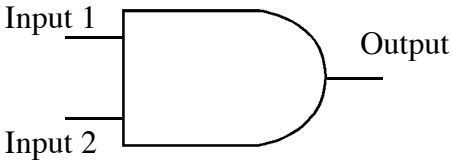
name the additional component required to activate this switch.



Switch: Reed (switch)
(2 marks)

Component: Magnet
(2 marks)

12. Complete the truth table for the logic gate shown.

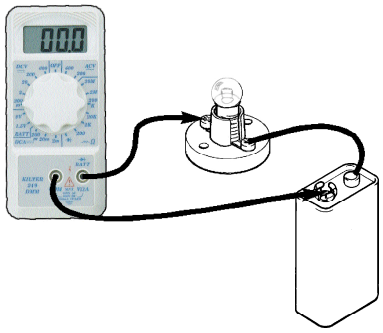


(4 x 1 marks)

Input1	Input 2	Output
0	0	**0**
1	0	**0**
0	1	**0**
1	1	**1**

13. In relation to the operating circuit shown what is being measured by the multimeter?

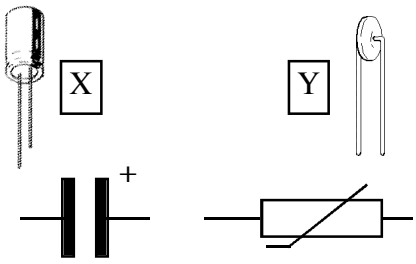
What units are used in this measurement?



Answer: Current
(2 marks)

Units: Amperes, Amps, A
(2 marks)

14. Name the electrical components represented by the symbols shown.

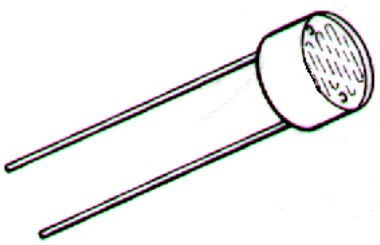


X: Capacitor (2 marks)

Y: Thermistor (2 marks)

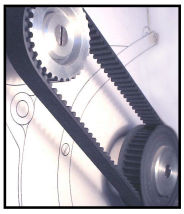
15. The sketch shows an <u>LDR</u>.

Explain the meaning of the underlined term.



LDR: LIGHT DEPENDANT RESISTOR
(4 marks)

16. State **two** advantages to using a toothed belt over a chain in an inkjet printer.

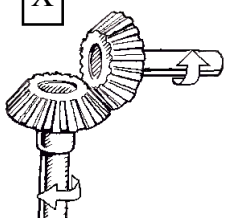


Any two - (2 x 2 marks)

Advantages: quieter,
easily fitted/removed,
no lubrication reqd.,
flexible,
low cost, etc.

17. Name the mechanisms shown.

X



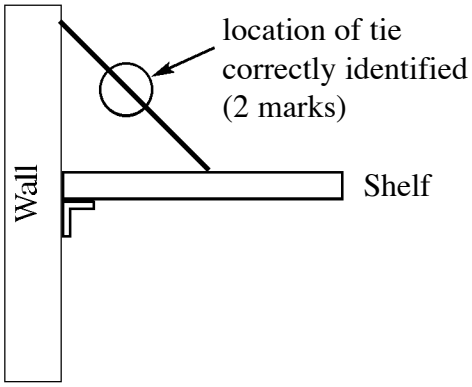
Y

X: Bevel (gears) (2 marks)

Y: Ratchet & Pawl (1 + 1 marks)

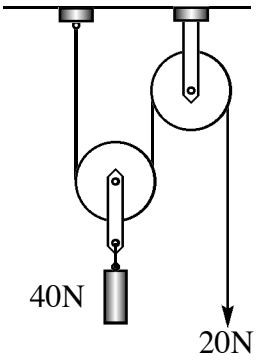
18. Identify clearly on the sketch where a tie should be placed to better support the shelf.

Name the force acting on the tie.



Force: Tension (2 marks)

19. Calculate the mechanical advantage of the pulley system shown.



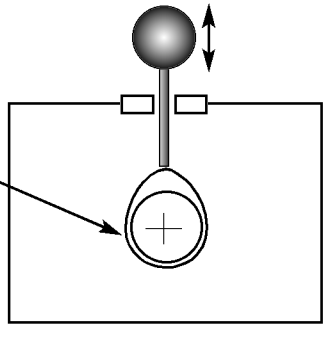
Mechanical advantage = 2
(4 marks)

MA = L/E ... *2 mks*
40/20 ... *1 mk*
2 ... *1 mk*

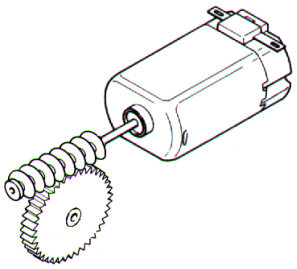
20. Name and sketch a rotating mechanism which will produce the reciprocating motion shown.

Sketch : of cam (2 marks)

Name: cam (2 marks)



21. Name **two** energy conversions taking place in an operating electric motor.



Any two - (2 x 2 marks)

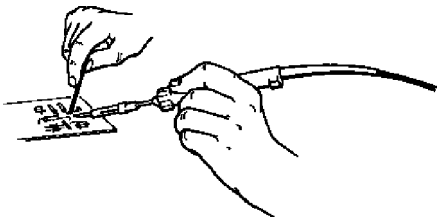
(i) & (ii): electrical (1)
to:
sound (1),
heat (1),
kinetic(1)

22. Name **two** properties found in man-made fabrics not found in natural fabrics.

Any two - (2 x 2 marks)

(i) & (ii): colour fast,
lighter,
waterproof,
breathable,
etc.
any valid property

23. State **two** safety precautions which must be observed when using a soldering iron.



Any two - (2 x 2 marks)

(i) & (ii): ventilation,
hair,
goggles,
stand for iron,
etc.
any valid precaution

24. State **two** advantages to digital cameras over film cameras.

Any two - (2 x 2 marks)

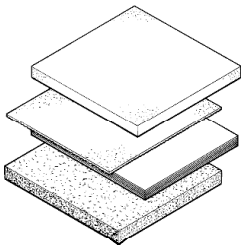
Advantages: can erase image,
can download to PC,
lower cost,
more control over image, etc.
any valid advantage

25. State **two** reasons why additives are used in modern foodprocessing.

Any two - (2 x 2 marks)

(i) & (ii): increase shelf life,
add vitamins,
add minerals,
flavour enhancers,
add 'good' bacteria
add colour, etc.
any valid reason

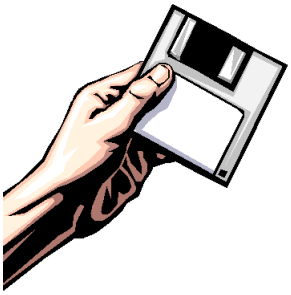
26. In relation to manufactured boards, explain the terms **MDF** and **Veneer**.



MDF: Medium Density Fibreboard (2 marks)

Veneer: *reference to* - thin layer of higher quality material on base layer (2 marks)

27. Name **two** methods of transferring data between computers, other than through floppy discs.

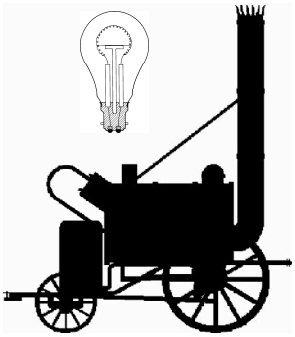


Any two - (2 x 2 marks)

(i) & (ii): memory stick, USB stick,ZIP disk, CD/DVD, network, wireless, etc. *any valid method*

28. From the list of inventors shown identify the inventor associated with each of the named inventions.

Inventors:
G. Eastman, T. Edison, M. Faraday, G. Marconi, G. Stephenson, J. Dunlop.



(2 + 1 + 1 marks)

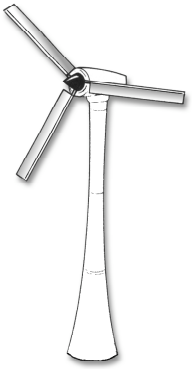
INVENTION	INVENTOR
Light Bulb	*T. Edison*
Steam Train	*G. Stephenson*
Electric Motor	*M. Faraday*

29. State **two** reasons why a completed task project should be evaluated.

Any two - (2 x 2 marks)

(i) & (ii): check against specs. (analysis), safety, costings, functionality, suitability, *any valid reason*

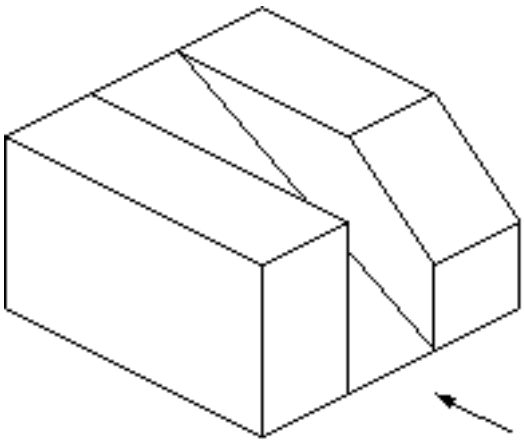
30. State **two** disadvantages to wind energy as an alternative energy source.



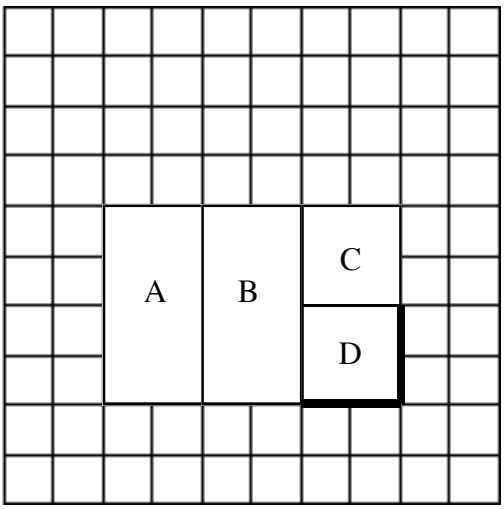
Any two - (2 x 2 marks)

Disadvantages: wind unreliable, low/high winds, large no. of units, small output, visual pollution, *any valid disadvantage*

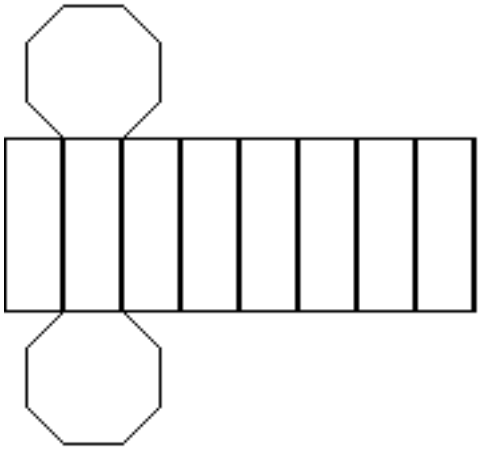
31. Complete the elevation of the component shown. (4 panels (A, B, C & D) x 1 marks)
in correct proportion



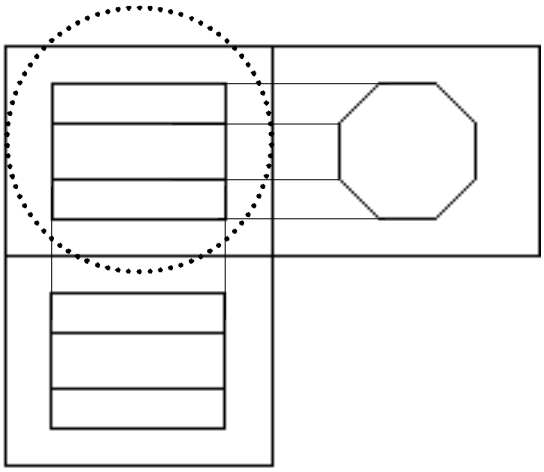
Elevation



32. Sketch the missing orthographic view of the development shown. (3 panels : 2 + 1 + 1 marks)



Development



Orthographic view

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HIGHER LEVEL

200 Marks

Wednesday, 21st June, Afternoon, 2:00 to 4:00

SECTION B and SECTION C

SECTION B - 50 Marks

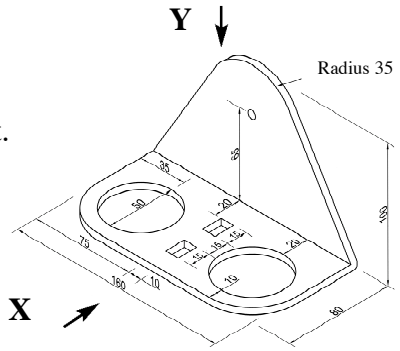
SECTION C - 50 Marks

INSTRUCTIONS

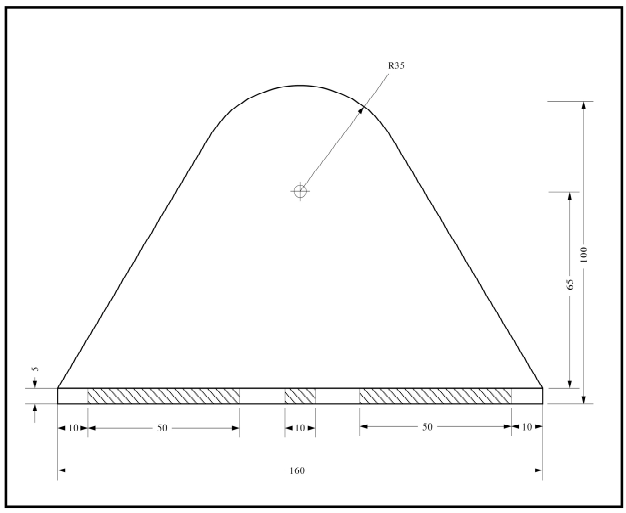
1. Answer either (a) or (b) from each question in Section B.
2. Answer one question from Section C.
3. Make sure to hand up Section A with your answer sheets to this paper.

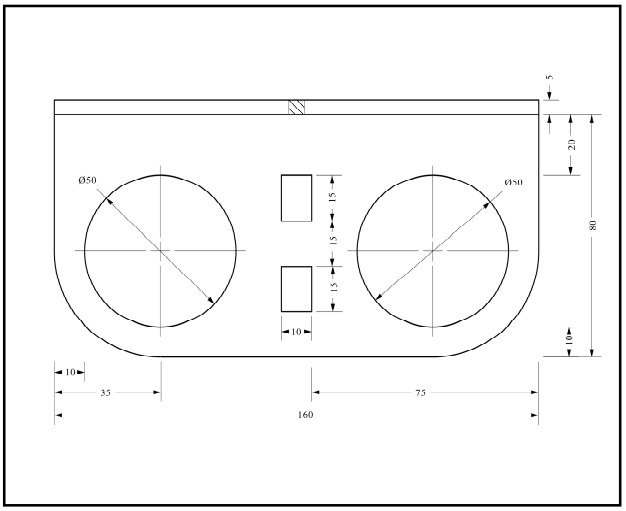
SECTION B - 50 Marks **Question 1, answer either (a) or (b) from this question.**

1 (a) The sketch shows a design for a bathroom tooth-brush and tumbler holder.
The holder will be manufactured from 5mm acrylic sheet.



All dimensions are in millimeters





(i) Using a suitable scale sketch:

1. An elevation looking in the direction of arrow 'X'.
   • *Correct view (elevation) (2 mark), All proportions correct (1 mark), 2 correct dimensions shown (2 x 1 marks)*

2. A plan view looking in the direction of arrow 'Y'.
   • *Correct view (plan) (2 mark), All proportions correct (1 mark), 2 correct dimensions shown (2 x 1 marks)*

Include all dimension lines in your sketch. **[Total: 10 marks]**

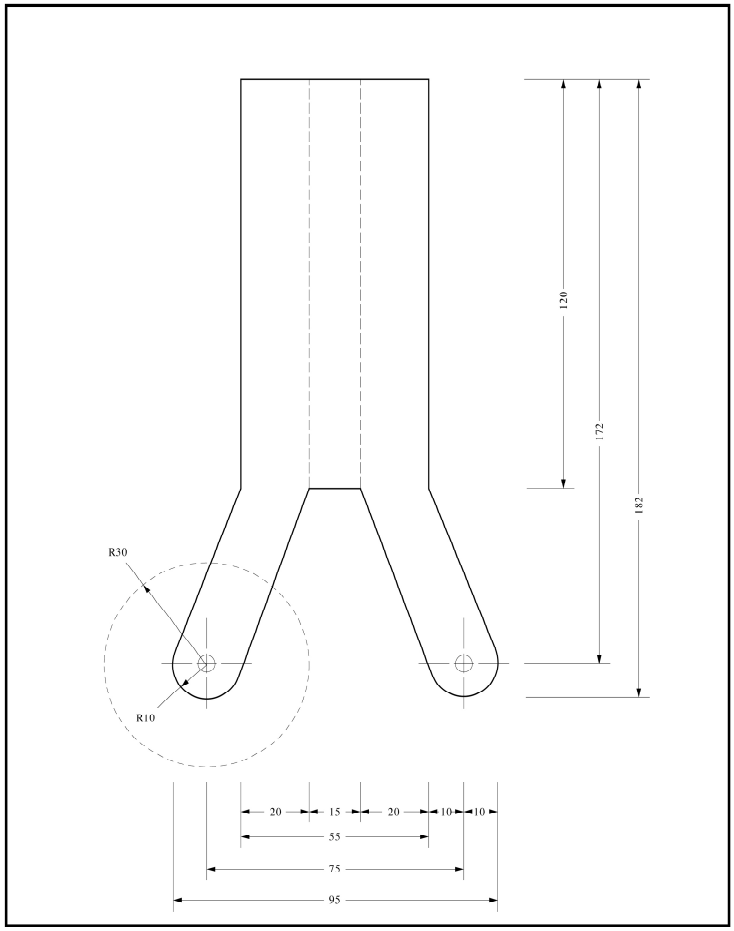
(ii) 1. Describe the steps required to cut the circular and rectangular holes in the acrylic.
• *2 Steps: marking out, drill, finish (file, sand).* (3 + 2 marks)

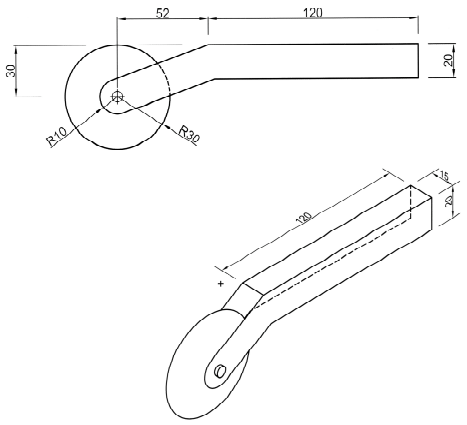
2. Describe the steps required to bend acrylic sheet to the angle shown.
• *2 Steps: marking out, use strip heater, shape on former, cool.* (3 + 2 marks)
[Total: 10 marks]

(iii) State **two** reasons why acrylic is a suitable material for this holder.
• *Any two valid reasons (3 + 2 marks)*
- low cost, easier to clean/keep clean, safe, easy to form, range of colours, etc.
[Total: 5 marks]

- OR -

1 (b) The sketch shows a design for a pizza cutter in elevation and isometric view.





All dimensions are in millimeters

(i) Using a suitable scale, draw a development of the material required to manufacture the handle. Indicate clearly all bend lines and show the overall dimensions.
- *Correct development (6 marks),*
- *2 correct overall dimensions shown (2 x 1 marks)*
- *2 bend lines shown (2 x 1 marks) (-1 mk if not 'dotted')* **[Total: 10 marks]**

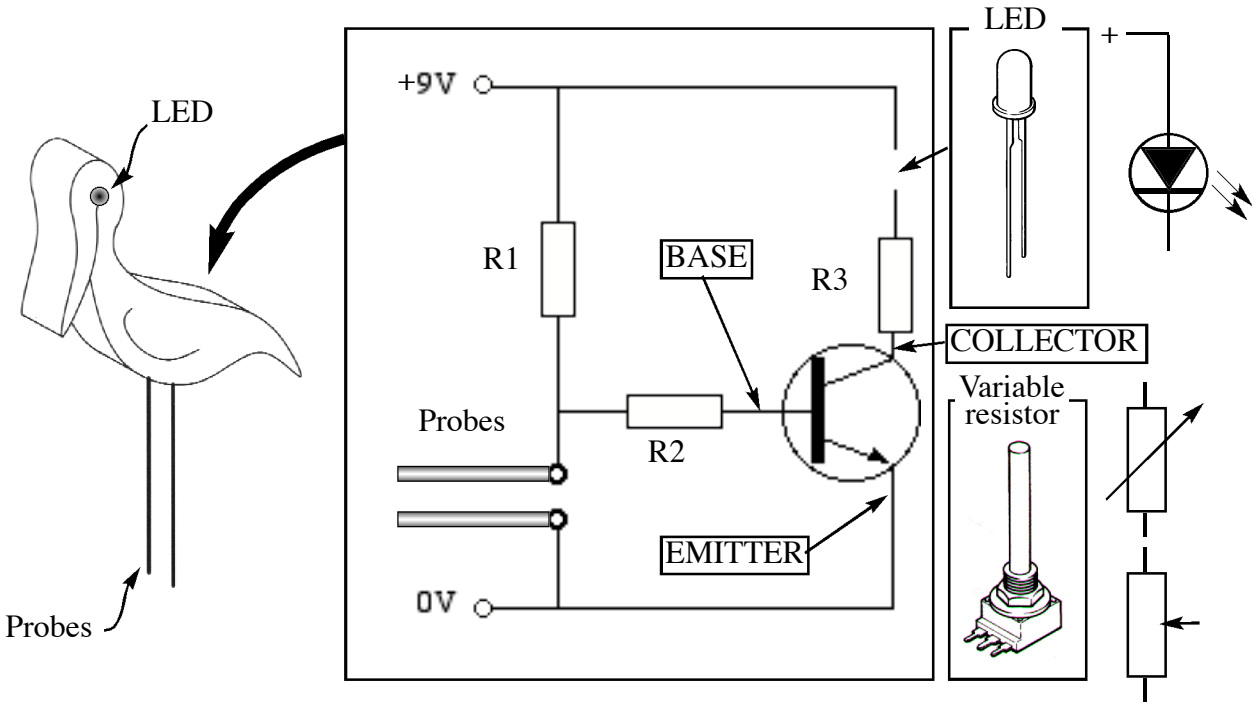
(ii) Name a suitable material and describe the steps required to shape the material into the handle design shown.
- *Appropriate material named - plastic, metal (2 marks),*
- *3 steps required to shape - markout, bend, finish (3 x 1 marks)* **[Total: 5 marks]**

(iii) 1. Indicate clearly how the wheel is mounted into the handle and sketch a means to allow the wheel to rotate freely on its axle.
- *Satisfactory means to mount wheel in handle (3/2/1 marks)*
- *Sketch a satisfactory means to allow wheel rotate (2/1 marks)*

Alt: • Combined sketch (5/3/1 marks)

2. When using the pizza cutter, the handle was found to be uncomfortable to hold. Sketch a design modification to correct this fault.
- *Valid design modification (2/1 marks)*
- *Quality of sketch (3/2/1 marks)* **[Total: 10 marks]**

2 (a) A moisture sensitive circuit, mounted in the body of the wooden bird, is required to light a red LED when the metal probes (legs) sense dry soil.



(i) 1. Sketch the electronic symbol for the LED and show how the LED should be connected to the +9V line in the circuit shown.
- *Correct LED symbol (3 marks)(-1 mk if arrows missing)*
- *How to connect to +9V (2 marks)*

2. Using a sketch of the transistor symbol shown, name and identify the three contacts on the transistor.
- *Base, Collector & Emitter correctly identified (2 + 2 + 1 marks)*

[Total: 10 marks]

(ii) 1. Explain the effect on the circuit of changing the positions of R1 and the probes.
- *Effect of change: circuit now senses WET soil (4 marks)*

2. Explain why a variable resistor is recommended as a replacement for R1. Sketch the symbol for a variable resistor.
- *Why VR - allows sensitivity of circuit to be adjusted, etc. (3 marks)*
- *Correct symbol sketched (3 marks)*

[Total: 10 marks]

(iii) The manufacturer data for the LED is as follows: Vf= 2V, I_{max} = 20mA.
Ignoring the resistance of the transistor, use this data to calculate the value of R3.

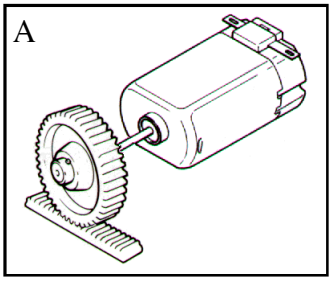
- *Ans: 350 (Ohms) (5 marks)*

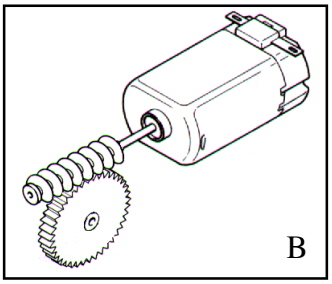
[Alt: formula (V/I=R) - 2 mks, Correct values used ((9-2)/.02) - 2 mks, 350 - 1 mk)

[Total: 5 marks]

- OR -

2 (b) A student intends to build a model of a motor driven car lift based on the image shown. The mechanisms labelled A and B are available for use in the model.





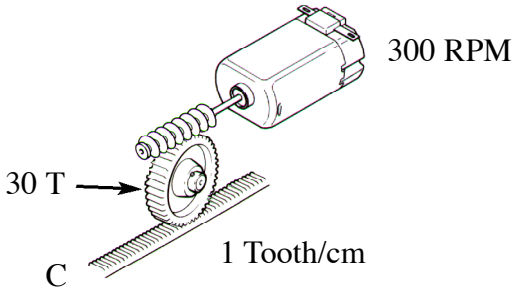
(i) 1. Name the mechanisms attached to the motor in A.
• *A - rack & pinion (gear). (2 + 1 marks)*

2. Name the mechanisms attached to the motor in B.
• *B - worm & wheel. (2 + 1 marks)*

3. State **two** advantages of mechanism B over mechanism A.
• *2 valid advantages - greater speed redn., prevent slip, compact, etc. (2 x 2 marks)*

[Total: 10 marks]

(ii) The student decided to use the combined mechanism shown.



1. If the motor speed is 300RPM, calculate the distance moved by part C in 2 minutes.

• *Ans. 600 (cm.) (6 marks)*
[300 rotations in 1 min, 600 rotations in 2 min - 2 mks,
30T gear will make 20 revolutions (600/30 = 20) - 2 mks,
20 rev x 30T = 600 teeth = 600 cm. - 2 mks]

2. Name the type of switch required to allow the motor turn clockwise and anticlockwise.
• *Double Pole Double Throw (switch) (4 x 1 marks)*

[Total: 10 marks]

(iii) A pneumatic version of this car lift is also available.

1. Explain the underlined word.
• *Pneumatic - Air driven. (3 marks)*

2. Name one other everyday use of pneumatics.
• *1 use/ex. - car tyres, spray painting, opening doors, etc. (2 marks)*

[Total: 5 marks]

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

Green technology has been described as any technology which is environmentally friendly.

(a) (i) Explain, giving **two** reasons, why it is important that technology should be 'Green'.
- *Explain with 2 reasons - (2 x 5 marks (5/3/1))*
- *renewable technology explained ... does not deplete existing resources, etc.*
- *sustainable technology explained ... resources will not 'run out', etc.*
- *non-polluting technology explained ... damage to environment/health, etc.*
- *recyclable technology explained ...resources / pollution, etc.*

(ii) Explain, using **two** appropriate examples, how 'Green' technologies are used in modern transport systems.
- *Explain with 2 examples - (2 x 5 marks (5/3/1))*
- *energy source ... green fuel / biofuel / hybrid engines / electric cars, etc.*
- *material source ... parts can be recycled ... ex tyres, plastic components, etc.*

(iii) Explain, using **two** appropriate examples, how 'Green' technologies are used in modern buildings.
- *Explain with 2 examples - (2 x 5 marks (5/3/1))*
- *energy source ... wood pellets, solar, wind, geothermal, etc.*
- *material source ... insulation, use of 'natural materials', etc.*
- *efficiencies ... reducing heat loss, recycling, etc.*

[Total: 30 marks]

Communication technologies are an important part of a modern business.

(b) (i) Outline, using **two** appropriate examples, how these technologies operate in a modern business.
- *Outline-operate with 2 examples - (2 x 5 marks (5/3/1))*
- *modern phone(mobile) features, office networking, www site/business, e-mail, etc.*

(ii) Outline, using **two** appropriate examples, the benefits these technologies have brought to consumers.
- *Outline-benefits with 2 examples - (2 x 5 marks (5/3/1))*
- *buy on-line, on-line tracking of purchase, price comparison, etc.*

[Total: 20 marks]

4. Control Systems & Technology and Society

Microprocessor controlled robotic devices are available to vacuum and clean in the home. The robot shown recharges from a wall power socket when required.

*i*Clean

(a) (i) Explain why these devices are referred to as 'robots'.
- *Explain (5 marks (5/3/1))*
- *device performs actions under programme (software) control or device responds to inputs in accordance with onboard programme, etc.*

(ii) Explain **two** functions of a 'microprocessor' in these devices.
- *Explain 2 functions (2 x 5 marks (5/3/1))*
- *runs programme, processes inputs, controls output, stores data in memory, etc.*

(iii) Explain how these devices could 'identify' and 'avoid' a wall in a room.
- *Explain 'identify' & 'avoid' (2 x 5 marks (5/3/1))*
- *identify ... using sensors*
- *avoid ... run (sub)programme to reverse motors, etc.*

(iv) Explain how these devices could 'remember' where to go to recharge.
- *Explain 'remember' (5 marks (5/3/1))*
- *store path previously followed in memory and reverse direction to recharge,*
- *signal emitted by charger followed to source, etc.*

[Total: 30 marks]

Industry robots are commonly used in cleaning, storage and manufacturing.

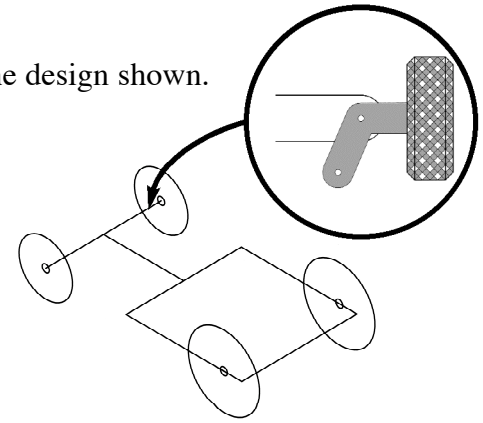
(b) (i) Outline **two** advantages to using robots in industry.
- *Outline 2 advantages (2 x 5 marks (5/3/1))*
- *repeat actions with accuracy, no'time out/ sleep' required, more flexible actions, perform heavy lifting, perform dangerous actions, etc.*

(ii) Explain, using **two** appropriate examples, the job skills required to operate or maintain industrial robots.
- *Explain 2 examples(2 x 5 marks (5/3/1))*
- *(re)programming/writing software, electronics - repair & build, engineer design & manufacture, etc.*

[Total: 20 marks]

5. Design and Manufacture

A student is required to manufacture a racing cart based on the design shown.



(a) (i) Name **two** materials from which the cart frame could be manufactured. State **one** advantage and **one** disadvantage to each material.

- *Material 1 named (2 marks)*
- *Advantage material 1 (2 marks)*
- *Disadvantage material 1 (2 marks)*

- *Material 2 named (2 marks)*
- *Advantage material 2 (2 marks)*
- *Disadvantage material 2 (2 marks)*

- strength, durability, easy to form,/shape, safety concerns, etc.

(ii) Outline **one** manufacturing & **one** finishing process required for each material named.

- *Material 1 (selected in (a) (i))*
- *Manufacturing process outlined (2 marks)*
- *Finishing process outlined (2 marks)*

- *Material 2 (selected in (a) (i))*
- *Manufacturing process outlined (2 marks)*
- *Finishing process outlined (2 marks)*

[Total: 20 marks]

(b) (i) Sketch in plan and elevation, a suitable lightweight body structure for the cart.

- *Correct plan view (2 marks)*
- *Quality of sketch (3 marks (3/2/1))*

- *Correct elevation view (2 marks)*
- *Quality of sketch (3 marks (3/2/1))*

(ii) Sketch and label a suitable steering system for the cart design shown.

- *Quality of sketch (5 marks (5/3/1))*
- *Suitable steering system (3 marks (3/2/1))*
- *System labelled (2 marks (2/1))*

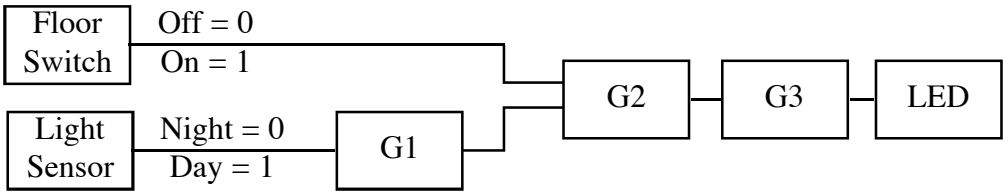
(iii) Sketch and label a suitable brake system for the cart.

- *Quality of sketch (5 marks (5/3/1))*
- *Suitable brake system (3 marks (3/2/1))*
- *System labelled (2 marks (2/1))*

[Total: 30 marks]

6. Control Systems

The parents of a young child require a system to light a flashing LED in the parent's bedroom, if the child gets out of bed during the night.
The automatic system should operate only in the dark.
A block diagram of a possible system is shown.
A latch is required at G3.



(a) (i) Identify the logic gates required at G1, and G2.
- *G1 = NOT (5 marks) (Inverter)*
- *G2 = AND (5 marks)*

(ii) Sketch and complete a truth table for logic gate G1.
- *Correct truth table ((4 x 1): (2 x input , 2 x output)+1 mark (I/O identified))*

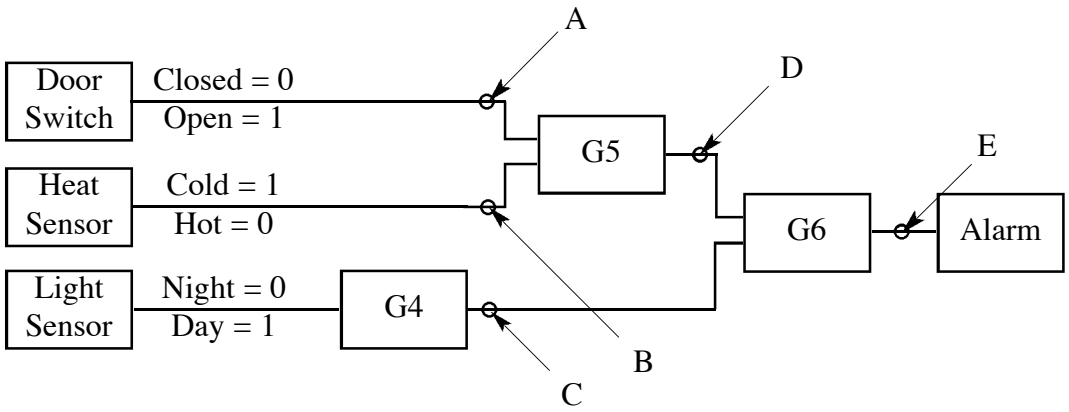
INPUT	OUTPUT
1	0
0	1

(iii) Explain why a latch is required at G3.
- *Explain latch (5 marks (5/3/1))*

- latch keeps LED flashing even when activating switch is off.

[Total: 20 marks]

A second system is required to sound an alarm, if the bedroom temperature drops or if the child leaves the bedroom at night.



(b) (i) Identify the logic gates required at G4, G5 and G6.
- *G4 = NOT (5 marks)*
- *G5 = OR (5 marks)*
- *G6 = AND (5 marks)*

(ii) Copy and complete the line from the truth table for this system for the logic states shown.
- *D =1, E = 1 (3 + 2 marks)*

A	B	C	D	E
0	*1*	*1*	**1**	**1**

[Total: 20 marks]

(c) Many modern household appliances contain electronic control systems.

Name **two** such appliances and outline the features provided by the electronic control systems.

- *Appliance 1 - containing electronic control system named (2 marks)*
- *Appliance 1 - feature outlined (3 marks)*

- *Appliance 2 - containing electronic control system named (2 marks)*
- *Appliance 2 - feature outlined (3 marks)*

Features - programmable to perform different functions: start / stop at different times, start when preset temperature reached, sense 'load' and provide appropriate programme, etc.

[Total: 10 marks]