



Coimisiún na Scrúduithe Stáit  
State Examinations Commission

## TECHNOLOGY

Junior Certificate Examination, 2005

HIGHER LEVEL

200 Marks

Wednesday, 22nd June, Afternoon, 2:00 to 4:00

## SECTION A MARKING SCHEME

### 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
<b>Section A</b>	
<b>Section B</b> Q1 (a)	
(b)	
Q2 (a)	
(b)	
<b>Section C</b> Q3	
Q4	
Q5	
Q6	
Total	
Grade	

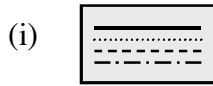
MAKE SURE TO WRITE YOUR EXAMINATION NUMBER IN  
THE BOX PROVIDED ON THIS PAGE

**Section A**

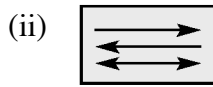
Answer 25 questions from this section - all questions carry equal marks.

100 marks

1. Explain the function of both of these computer drawing programme icons.



(i): Line(1) style(1)  
(type of line)

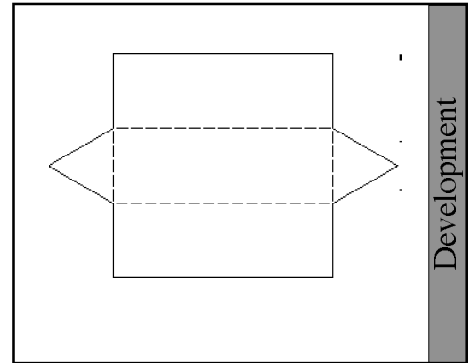
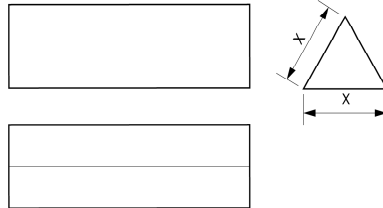


(ii): Arrow head(s) on line

1st correct: 3 marks

2nd correct: 1 mark

2. Complete the development of the chocolate bar wrapper shown.



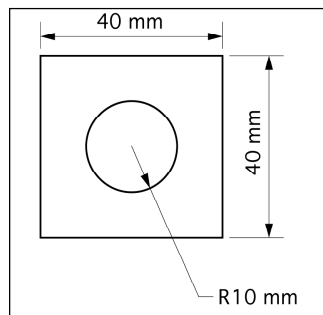
Development

3 rectangles: 2 marks

2 triangles: 2 marks

(-1 for each item missing, / missing dotted line, incorrect prop.)

3. State **two** advantages of using CAD to produce drawings?



CAD Drawing

(i): Any two valid ans.:

(ii): 1st correct: 3 marks

2nd correct: 1 mark

Drawing easily changed  
or autodimension  
or can be saved/recalled  
or easily changed,  
or neat/accurate, etc

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

(i) ROM

(ii) CPU



ROM: Read Only Memory

CPU: Central Processing Unit:

1st correct: 3 marks

2nd correct: 1 mark

5. State **two** reasons why some manufacturers no longer supply floppy disk drives with new computers?



(i): Any two valid ans.:

(ii): 1st correct: 3 marks

2nd correct: 1 mark

Storage too small  
or unreliable  
or larger storage available  
(CD/ZIP/memory sticks)

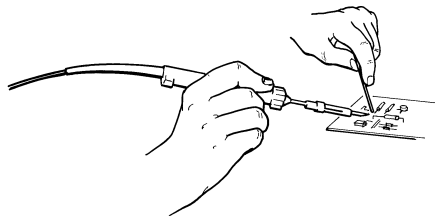
6. Indicate if the timbers listed are a softwood or a hardwood.



Beech: Hardwood: 1 mark  
 Teak: Hardwood: 1 mark  
 Pine: Softwood: 1 mark  
 Oak: Hardwood: 1 mark

7. Solder is an alloy.  
 Explain the underlined word.

Name **one** other alloy.



Alloy: Mixture of a metal and another element

Name: Any one valid example  
 Brass/Bronze/Steel, etc.

1st correct: 3 marks  
 2nd correct: 1 mark

8. Name the tool shown

*and*

name a material which can be shaped using this tool.

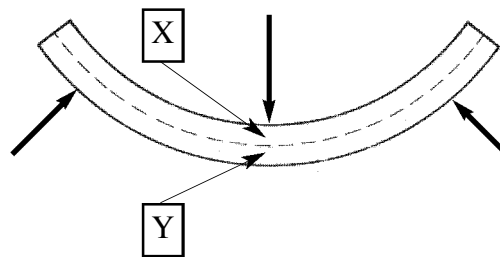


Tool: Snips

Material: Metal  
 Plastic/Wood/Paper : 0 mks

1st correct: 3 marks  
 2nd correct: 1 mark

9. Name the forces at X and at Y in the beam shown.



Force X: Compression  
 Force Y: Tension

1st correct: 3 marks  
 2nd correct: 1 mark

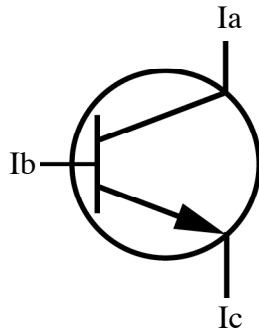
10. State **two** advantages of plastic containers over glass containers for soft drinks.



(i): Any two valid ans.:  
 (ii): 1st correct: 3 marks  
 2nd correct: 1 mark

Lighter (than glass)  
 or Safer / Thin walls  
 or Complex shapes,  
 or Cost, etc

11. Which statement concerning the current flow in the transistor shown is correct?



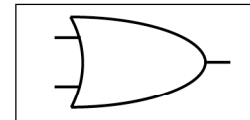
- Statement A:  $I_c = I_a - I_b$   
**Statement B:  $I_c = I_a + I_b$**   
 Statement C:  $I_c = I_a \div I_b$   
 Statement D:  $I_c = I_a \times I_b$

Answer: B: 4 marks

12. Name and sketch the symbol for the logic gate which will produce the truth table shown.

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

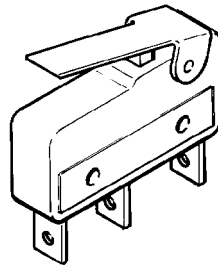
Gate: OR  
 Symbol: shown



1st correct: 3 marks  
 2nd correct: 1 mark

13. In relation to a switch state the meaning of the following abbreviations:

- (i) COM  
 (ii) NC

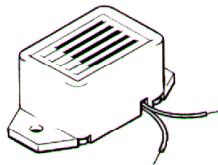


COM: Common  
 NC: Normally Closed

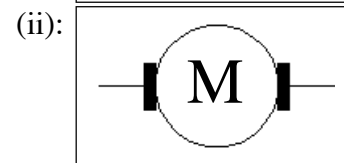
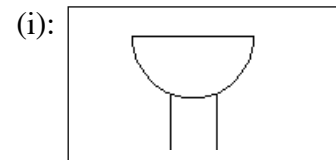
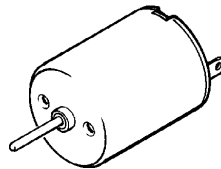
1st correct: 3 marks  
 2nd correct: 1 mark

14. Sketch the circuit symbols for the components shown.

(i) Buzzer



(ii) Motor



1st correct: 3 marks, 2nd correct: 1 mark

15. Indicate clearly on the circuit shown the correct location of:

an ammeter



**In series as shown**

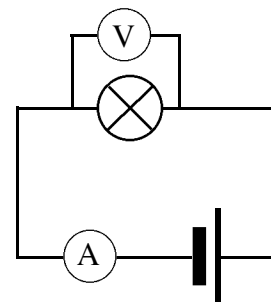
and

a voltmeter,



**In parallel as shown**

to measure the resistance of the bulb when lighting.

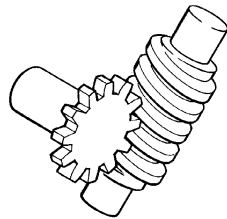


1st correct: 3 marks, 2nd correct: 1 mark

16. Name the mechanism shown

and

state **one** advantage in using this mechanism to lift a load.



Name: Worm (gear)

Advantage: Any 1 valid ans.:

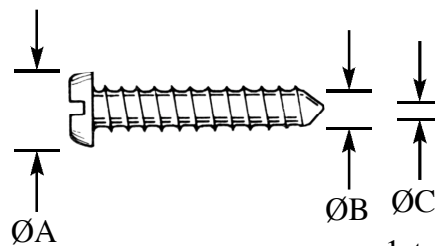
Large torque  
or will not slip  
or speed reduction,  
or direction change, etc.

1st correct: 3 marks, 2nd correct: 1 mark

17. Name the type of screw shown

and

state which diameter drill bit A, B or C, should be used to make a pilot hole for the screw.

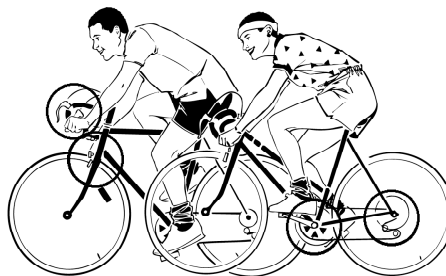


Name: Self tapper  
(Screw =0, Slot head =1)

Drill bit: B

1st correct: 3 marks, 2nd correct: 1 mark

18. Identify **two** mechanisms on a bicycle where friction is essential to the cyclist.

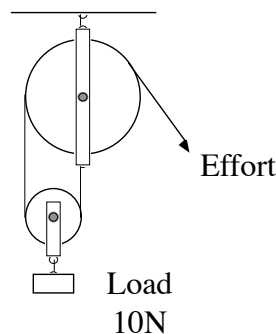


(i): Any two valid ans.:  
(ii): 1st correct: 3 marks  
2nd correct: 1 mark

Brakes  
Gears, etc

19. Calculate the effort required to lift the load.

Why is the measured effort greater than the calculated effort?

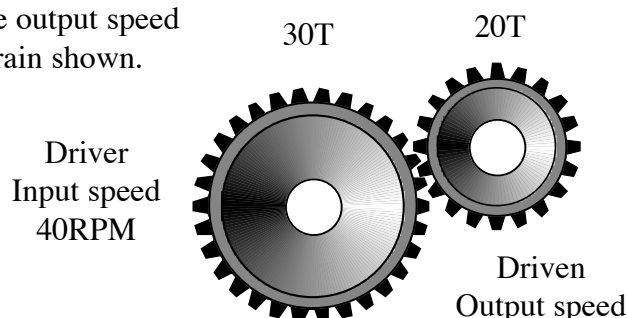


Effort: 5(N)

Reason: Friction

1st correct: 3 marks  
2nd correct: 1 mark

20. Calculate the output speed in the gear train shown.



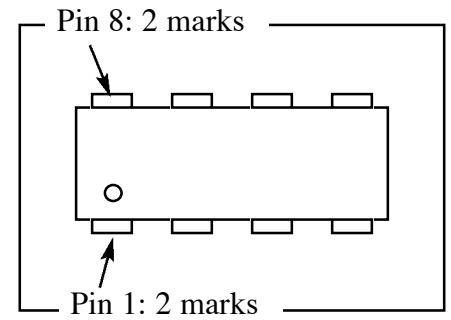
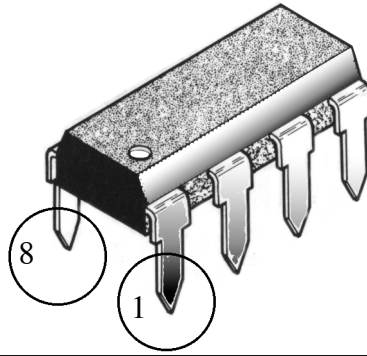
Output speed: 60(RPM): 4 marks

Alt:  $40 \times 30 = 20 \times 'X'$   
or  
Formula: 2 marks

21. Indicate clearly the locations of pin 1

and

pin 8 on the chip shown.

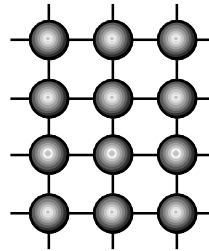


1st correct: 3 marks, 2nd correct: 1 mark

22. Identify the thermosetting plastic in the following list:  
Polythene, PVC, Bakelite

and

state **one** use for a thermosetting plastic.



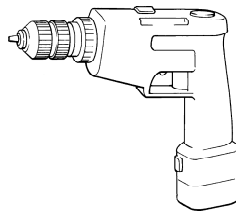
Thermoset: Bakelite

Use: One valid use  
Light switch,  
pot handle, etc

1st correct: 3 marks

2nd correct: 1 mark

23. State **two** safety precautions which must be observed when using an electric hand drill.



(i): Any two valid ans.:  
(ii): 1st correct: 3 marks  
2nd correct: 1 mark

No loose hair  
or remove chuck key  
or support workpiece,  
or goggles, etc

24. Explain the term 'computer virus'.



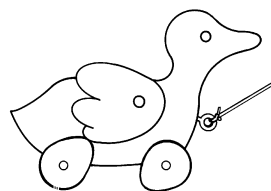
Computer virus:  
valid answer: 4 marks

A **programme/doc.** which can cause a **named difficulty** with a PC

1st correct: 3 marks

2nd correct: 1 mark

25. State **two** reasons for making a model as part of the design process.



(i): Any two valid ans.:  
(ii): 1st correct: 3 marks  
2nd correct: 1 mark

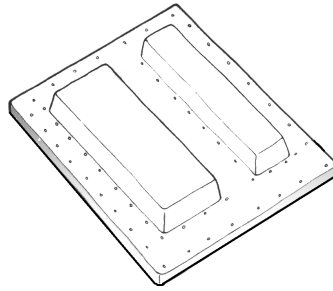
Test design,  
or check sizes, etc.  
or check safety issues, etc.

26. In the vacuum forming mould shown, explain why

(i) the sides of the mould are sloped

and

(ii) holes are drilled in the base.



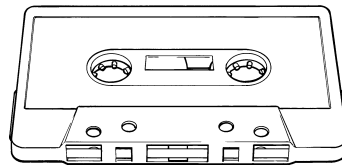
(i): Sloped : Ease of removal of workpiece

(ii): Holes: allow air flow through mould

1st correct: 3 marks

2nd correct: 1 mark

27. Name **two** audio recording technologies which have replaced cassette tapes.



Cassette tape

(i): Any two valid ans.:

(ii): 1st correct: 3 marks

2nd correct: 1 mark

CD / DAT / DVD / Mini Disk / HD / Memory chip/stick, etc.

28. State **two** reasons why a plastic bag levy was introduced by the government.



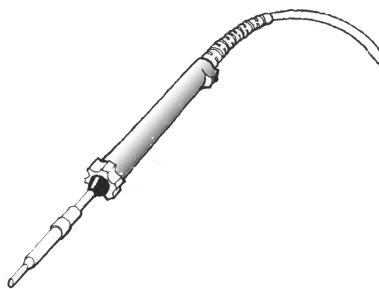
(i): Any two valid ans.:

(ii): 1st correct: 3 marks

2nd correct: 1 mark

Reduce waste  
or Pollution  
or Encourage recycling , etc.

29. When soldering a component to copper stripboard, name **two** procedures which will ensure a good joint.



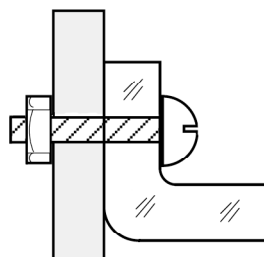
(i): Any two valid ans.:

(ii): 1st correct: 3 marks

2nd correct: 1 mark

Use (flux) to clean ...  
or Clean iron on sponge  
or do not move component until solder sets /use heat sink,  
or iron to reach correct temp.  
etc.

30. State **two** items of information communicated by the sketch.



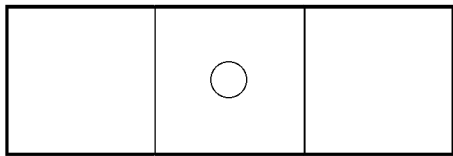
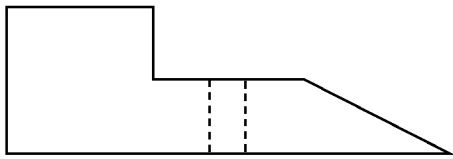
(i): Any two valid ans.:

(ii): 1st correct: 3 marks

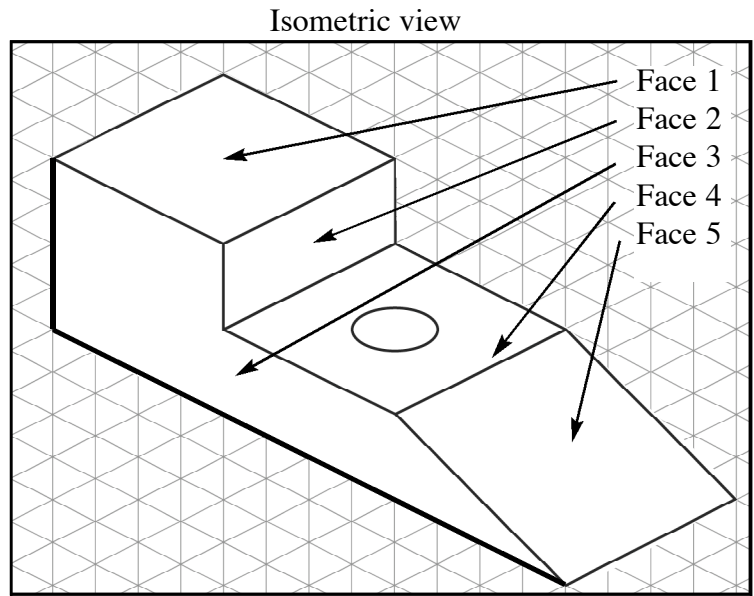
2nd correct: 1 mark

2 different materials used  
or Nut & Bolt used  
or One material bent  
or Dome head bolt used, etc.

31. Complete the isometric sketch of the component shown.

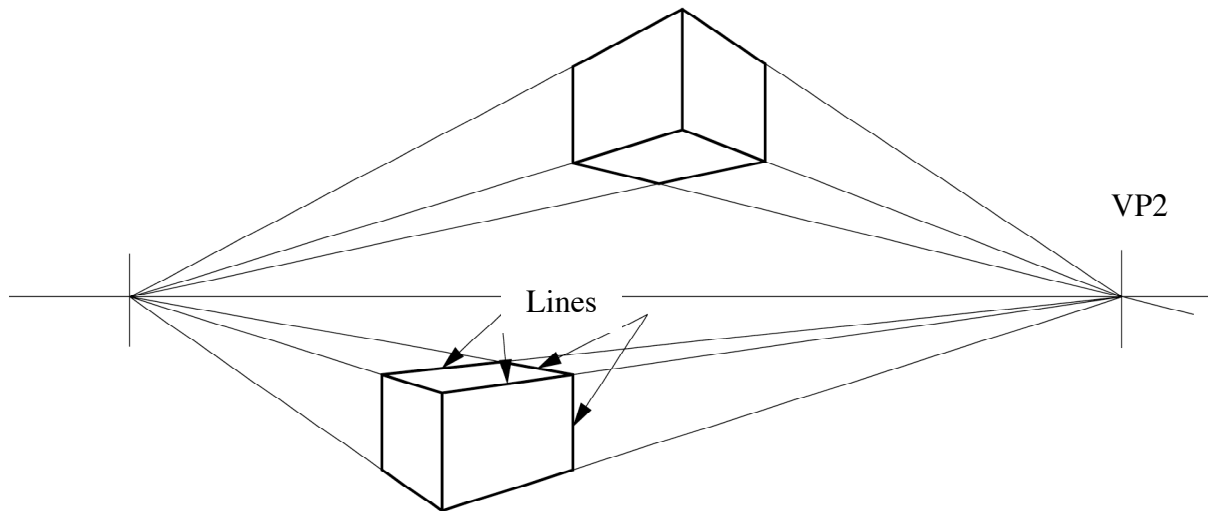


Orthographic view

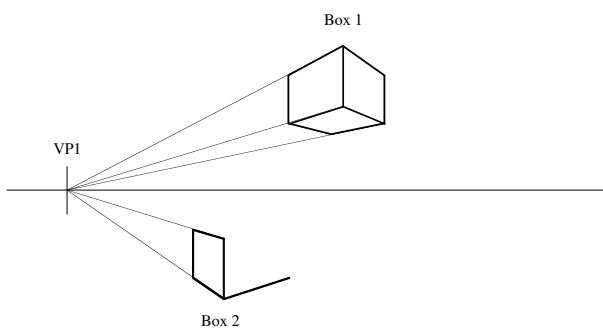


Any 4 faces shown in correct proportions sketched: 4 x 1 mark

32. Locate the second vanishing point (VP2) and complete the perspective view of box 2.



Locate VP2 (constr. lines not reqd.): 2 marks  
Any three of four lines shown sketched: 2 marks







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## **TECHNOLOGY**

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Junior Certificate Examination, 2005

HIGHER LEVEL

200 Marks

Wednesday, 22nd June, Afternoon, 2:00 to 4:00

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## **SECTION B and SECTION C MARKING SCHEME**

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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.

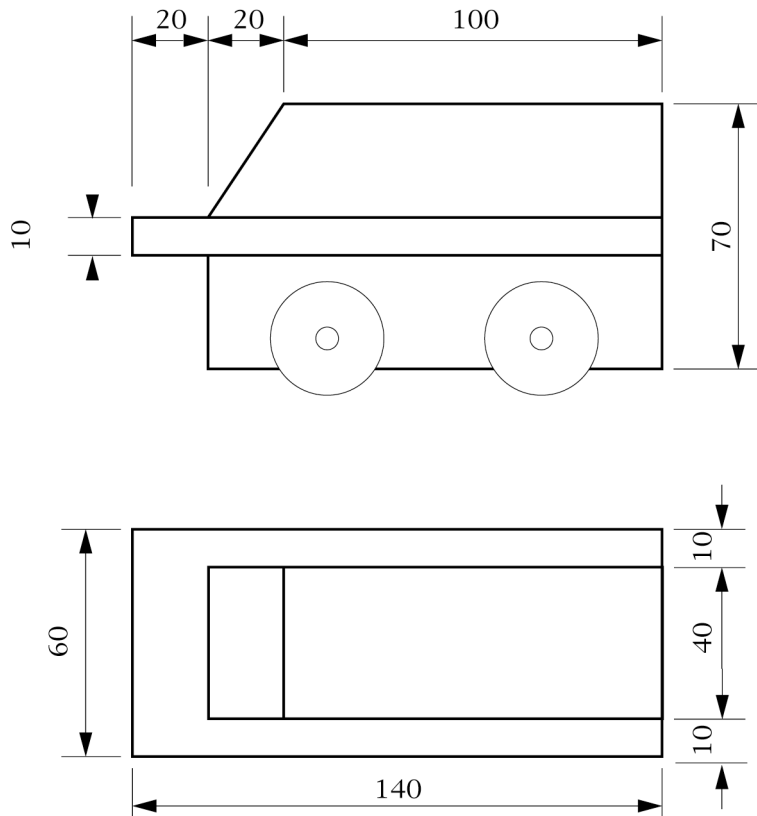
- 1 (a) The sketch shows a design for a motorised vehicle.  
The vehicle will be manufactured from acrylic (cab) and wood (body).

All dimensions are in millimeters

(i) Using a suitable scale sketch:

1. An elevation looking in the direction of arrow 'X', indicate the approximate positions of the wheels.
2. A plan view looking in the direction of arrow 'Y'. Include all dimension lines in your sketch.

10 marks



(i) 1

Correct Elevation : 2 mark  
In proportion : 2 marks  
Dimensions shown : 1 marks  
(wheels not reqd.)

Min. 2 dim./sketch

(i) 2

Correct Plan View : 2 mark  
In proportion : 2 marks  
Dimensions shown : 1 marks

- (ii) Identify **two** areas of the design which present a safety concern and sketch an alternative design.

5 marks

1st area identified : 1 mark,  
2nd area identified : 1 mark,

Alt. design sketched : 2 marks  
Alt. design sketched : 1 marks

- (iii) 1. Sketch a design for a means to open and close the acrylic cab to allow access to the motors and batteries.

Suitable design : 2 marks,

Quality of sketch : 3 marks ( 1,2,3)

2. Sketch and label a suitable mechanism which will allow a 'driver' to bob up and down as the vehicle moves.

10 marks

Suitable mechanism : 2 marks,

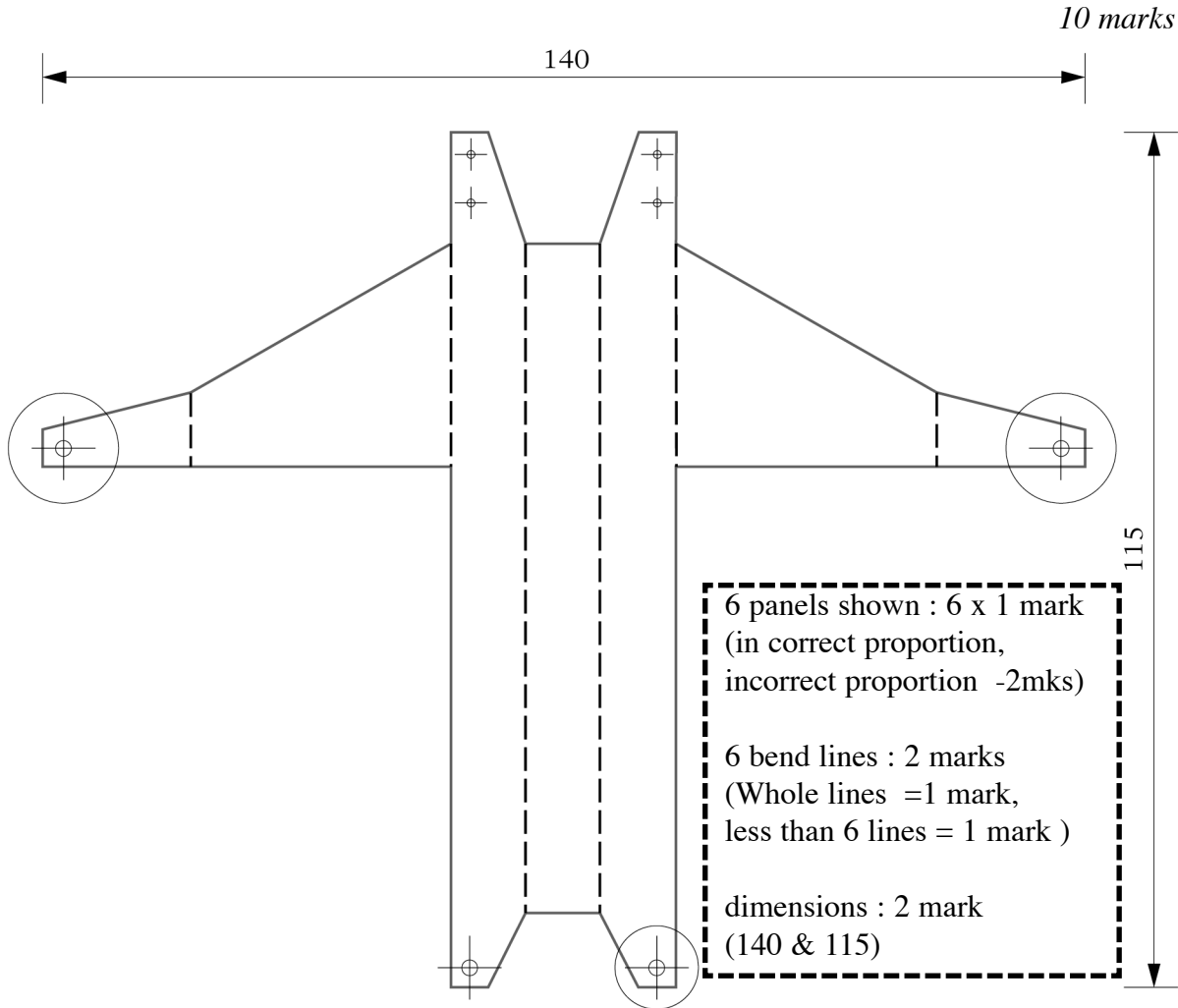
Quality of sketch : 3 marks ( 1,2,3)

- OR -

- 1 (b) The sketch shows a design for an acrylic undercarriage for a model plane.  
The wings, tail plane, rudder and electric motor are omitted.

All dimensions are in millimeters

- (i) Using a suitable scale, draw a development of the undercarriage.  
Indicate the approximate positions of the drill holes.  
Indicate clearly all bend lines and show the overall dimensions.



- (ii) 1. Indicate clearly the correct steps required to drill the acrylic,  
for the wheels and engine mount, at the points indicated.

3 steps: 2 + 2 + 1 = 5 marks (mark, clamp, drill, etc.)

2. Indicate clearly the steps you would take to manufacture and  
finish the undercarriage from a sheet of acrylic.  
Name all equipment required.

10 marks

3 steps: 3 x 1 mark, (cut, bend, finish) 2 tools: 2 x 1 mark (saw, heater, file)

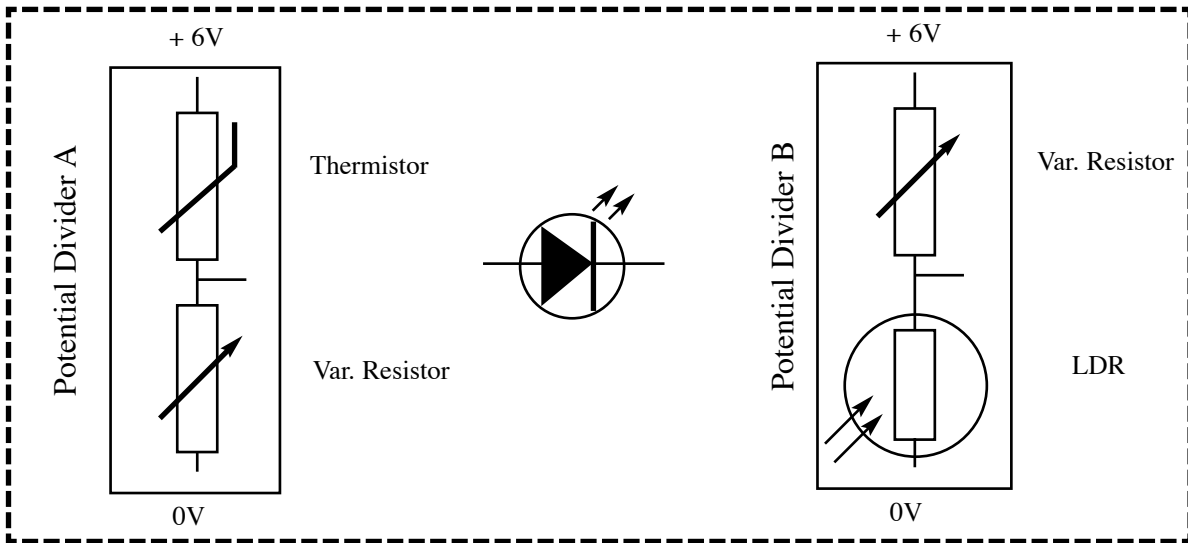
- (iii) Sketch a suitable design modification which will reduce the weight of  
this undercarriage without reducing the strength.

5 marks

Suitable design : 2 marks, Quality of sketch: 3marks (1,2,3)

2 (a) A circuit is required for a child's electronic storybook, as shown, which will:

- show a red glow in the fire icon when the child's hand warms the word 'FIRE' in the story OR
- light up the moon icon when the child covers the word 'MOON' in the story.



(i) 1. Indicate clearly the colour codes for the 330R and 2k2 resistors in the circuit.

330R: ORANGE: 1 mark, ORANGE: 1 mark, BROWN: 1 mark.  
2k2: RED: 1 mark, RED: 1 mark, RED: 1 mark.

2. Sketch the symbol for the LED and indicate clearly how to identify the negative leg on the LED. 10 marks

Symbol (as shown): 2 marks, Identify leg= short leg/bevel/view: 2 marks.

(ii) 1. Using the appropriate component symbols, sketch the circuit diagram for potential divider A.  
2. Using the appropriate component symbols, sketch the circuit diagram for potential divider B.

P.D. A : Component symbol: Thermistor: 1 mark, (Var.) Resistor: 1 mark.  
Correct Locations (as shown): Thermistor: 1 mark, (Var.) Resistor: 1 mark.

P.D. B : Component symbol: LDR: 1 mark, (Var.) Resistor: 1 mark.  
Correct Locations (as shown): LDR: 1 mark, (Var.) Resistor: 1 mark.

3. State **one** advantage of constructing this circuit on printed circuit board in place of copper strip board. 10 marks

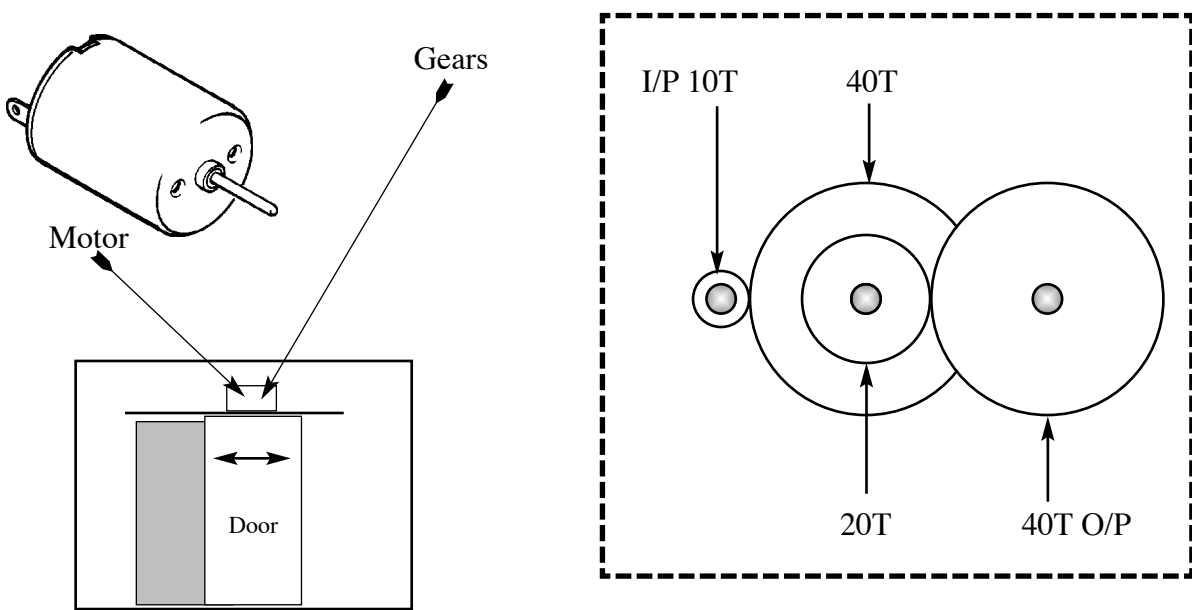
1 valid advantage( faster, neater, less error, etc.): 2 marks

(iii) The maximum current for the red LED used is 20mA. If a 9V power supply was used in place of the 6V supply, show how you would calculate the value of the required protective resistor. 5 marks

Formula:  $V/I = R$ : 2 mks,  $9/0.02$ : 2 mks,  $[9/20 = 1\text{mk}]$ ,  $450(R/\Omega)$ : 5 mk.

- OR -

- 2 (b) The sketch shows the components required to control the movement of a sliding door. A DPDT relay and limit switches are also required.



- (i) 1. Explain the abbreviation DPDT.

Double Pole Double Throw: 4 marks (4 x 1)

2. Explain why a DPDT relay is used in this situation.

Forward(2) & Reverse(1): 3 marks / Change dirn.: 3 mks

3. Explain why limit switches are required.

10 marks

Limit switches: Stop motor/door (2) at track end (1), etc.: 3 marks

- (ii) 1. Arrange the gears shown to produce the maximum possible speed reduction when connected to the motor.

Gear arrangement (above): 5 marks [10/40:2mks, 40/20:1mk, 20/40: 2 mks]

2. If the motor turns at 16 RPM, calculate the output speed of this gear arrangement.

10 marks

16RPM x 10T = 40T x [4 RPM]: 3 marks  
4 RPM x 20T = 40T x [2 RPM]: 2 marks      Formula only: 2 mks

- (iii) Sketch and name **two** alternative mechanisms which will allow the motor and gear system to move the sliding door.

5 marks

1st valid named mechanism: 2 marks, Correct sketch: 1 mark  
2nd valid named mechanism: 1 marks, Correct sketch: 1 mark  
(ex: Rack & pinion, Gear & chain, Pulley & belt)

## 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**

*Microelectronics are now widely used in society.*

20 marks

- (a) (i) *Using appropriate examples, name **two** areas where microelectronics are found in the home and outline their use.*

1st ex. microelectronics identified: 3 marks, Use outlined: 2 marks (1,2)  
2nd ex. microelectronics identified: 3 marks, Use outlined: 2 marks (1,2)  
(Ex: In CD/DVD/Remote control/Microwave control, etc. Use: satisfactory outline)

- (ii) *Explain, giving **two** reasons, why many devices containing microelectronics are regarded as disposable.*

1st Reason: 4 marks  
2nd reason: 4 marks  
(Ex: too expensive to repair, new cost less than old, out of date quickly, etc.)

- (iii) *Outline a means of managing the appropriate disposal of microelectronic devices.*

Managing disposal: 2 marks (1,2)  
(Recycling all or part, Recovering components/materials, etc.)

*Alternative energy sources, such as solar, wind and tide, are commonly used to supplement traditional energy sources in providing energy for the national electricity grid.*

20 marks

- (b) (i) *Outline **two** concerns regarding traditional energy sources.*

1st Concern outlined: 4 marks  
2nd Concern outlined: 4 marks  
(Ex: Limited supply, Polluting(fossil fuel), etc.)

- (ii) *State **one** impact which the construction of each of these alternative energy sources will have on the environment.*

1 impact Solar/Wind/Tide: 6 marks  
(Ex; Positive impact related to less pollution, negative impact: visual, etc.)

- (iii) *Outline **one** disadvantage associated with the operation of each of these alternative energy sources.*

Solar Disadv: 2 mks (1,2) Wind Disadv.: 2 mks (1,2) Tide Disadv.: 2 mks (1,2)  
(Ex; Visual (wind farms), Tidal/Water sources alter water use, Output limited, etc)

*Digital technologies are commonly found in consumer goods from digital images to digital music.*

- (c) *Using appropriate examples, outline **two** advantages of digital technology over older technologies.*

10 marks

1st example: 3 marks, 1st ex. Advantage digital technology: 2 marks  
2nd example: 3 marks, 2nd ex, Advantage digital technology: 2 marks  
(Ex: CD/DVD/TV, etc. Adv: Better quality, Size, easy to manipulate, etc.)

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

Robotic devices are commonly preferred in space exploration as shown. 35 marks



- (i) Explain, giving **two** reasons, why robots are preferred in this situation.

1st Reason: 5 marks  
(Ex: Environment too dangerous for people, can operate for long hours, disposable, etc.)

2nd Reason: 5 mark  
(Ex: Environment too dangerous for people, can operate for long hours, disposable, etc.)

- (ii) Explain the function of a **computer programme**, a **computer interface** and **sensor feedback** in the operation of the Mars Rover.

Explain function: Computer programme: 5 marks (1,4,5)  
(Ex: control operation of Rover, Allow Rover to operate without human intervention, etc)  
Explain function: Computer interface: 5 marks (1,4,5)  
(Ex: Allow computer operate Rover hardware(motors/sensors, etc))  
Explain function: Sensor feedback: 5 marks (1,4,5)  
(Ex: Provide data from sensors( tilt/temp./light(solar),etc) to computer programme, etc)

- (iii) Explain why an on-board computer and an earth based computer are required to control the Mars Rover missions.

Explain why on-board computer: 5 marks(1,4,5)  
(Ex: control local Rover functions/operations, provide local control, etc.)  
Explain why earth based computer: 5 marks(1,4,5)  
(Ex: monitor data from Rover, Update/upload instructions to on-board computer, etc.)

Manufacturing industry commonly use robotic arms on production lines.

15 marks

- (iv) Explain why robotic arms are designed with up to 'six degrees of freedom'.

Six degrees of freedom: 5 marks(1,4,5)  
(Ex: Arm can access all parts of production part,  
Arm can move fwd/back, up/down, left/right, etc.)

- (v) Explain why robotic arms are an essential part of a 'flexible manufacturing system'.

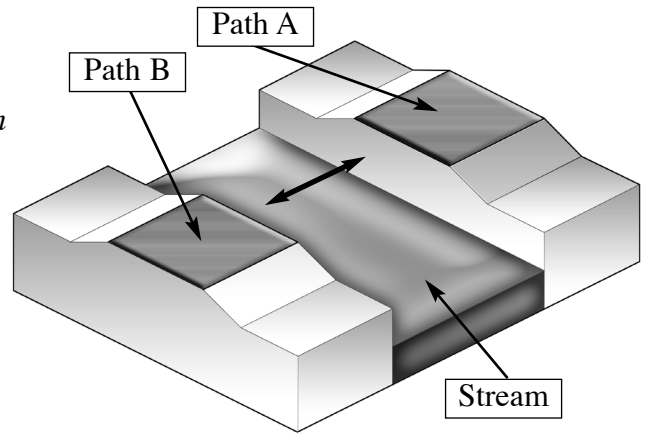
Flex. Manuf. System: 5 marks(1,4,5)  
(Ex: Arms can be reprogrammed to manufacture different products, etc.)

- (vi) Explain why robotic arms will never completely replace a human workforce.

Robotic Arm/Human workforce: 5 marks(1,4,5)  
(Ex: Human workforce more 'flexible'/can react to unexpected sit./, etc.)

5. **Design and Manufacture**

A model of a retractable bridge is required to span the stream between the paths A and B shown. One person must be capable of extending and retracting the lightweight bridge.



(a) 20 marks

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

1st suitable material: 2 marks	2nd suitable material: 2 marks
1st material : valid advantage: 2 marks, valid disadvantage: 2 marks	
2nd material : valid advantage: 2 marks, valid disadvantage: 2 marks	

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

1st material : outline manuf. process: 2 marks, outline finishing process: 2 marks
2nd material : outline manuf. process: 2 marks, outline finishing process: 2 marks

(b) 30 marks

(i) Sketch a suitable lightweight structure for the bridge.

Quality of sketch: 10 marks (5,7,10)
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(ii) Indicate **two** different structural features which will prevent distortion of the bridge.

1st valid structural feature identified/indicated/sketched: 5 marks
2nd valid structural feature identified/indicated/sketched: 5 marks

(iii) Sketch a suitable mechanism which will allow one person to easily extend and retract the bridge.

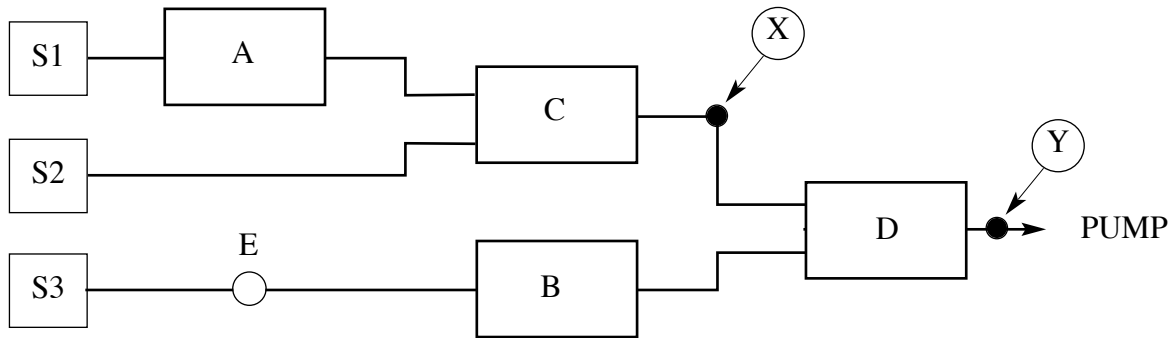
Quality of sketched mechanism: 5 marks
Valid mechanism to extend & retract: 5 marks



6. **Control Systems**

A block diagram for a system to control the water levels in a tank is shown.

The system will turn on a water pump if low water levels are detected at sensor S1 or an override switch S2 is activated. The pump will not operate if high levels are detected at sensor S3. Sensor S1 produces a logic state of 0 at low water levels. Sensor S3 produces a logic state of 1 at high water levels. A latched alarm is required at E.



(a) 30 marks

(i) Identify the logic gates required at A, B, C and D.

**A: NOT : 3 marks / B: NOT : 3 marks / C: OR : 3 marks / D: AND : 3 marks**

(ii) Copy and complete the partial truth table for this gate arrangement.

S1	S2	S3	X	Y
0	0	1	1	0
1	0	1	0	0

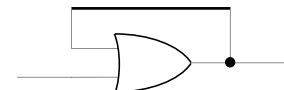
Truth table: 4 x 3 marks

(iii) Explain the term 'Latch'.

Latch explained: 3 marks (1,2,3) (Ex: When I/P goes 'high'(1), O/P goes 'high' (1) & remains high even if I/P goes low / O/P remains high (1) unless reset)

(iv) Outline the gate arrangement required to produce the latch.

Outline how to set up OR gate: 3 marks  
(Ex: O/P linked back to I/P(2), OR(1))

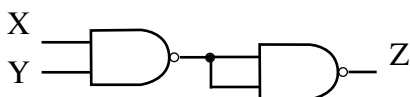


NAND gates can be combined to produce other logic gates  
(a NAND gate is an AND gate followed by a NOT gate).

20 marks

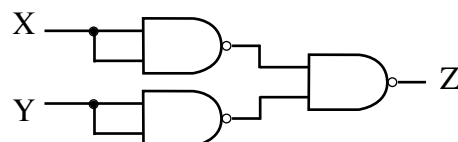
(b) Use truth tables to determine which logic gate is equivalent to the NAND gate arrangements shown below?

(i) 1st gate arrangement : AND: 2 marks  
4 lines in truth table: 4 x 2 marks



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

(ii) 2nd gate arrangement : OR: 2 marks  
4 lines in truth table: 4 x 2 marks



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