



Junior Certificate Examination, 2015

Technology

Higher Level

Wednesday, 17 June
Afternoon, 2:00 - 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 **Section C**.

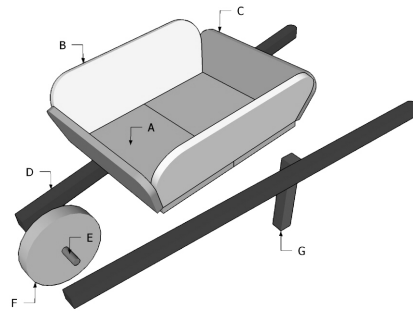
Centre Number

Examination Number

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

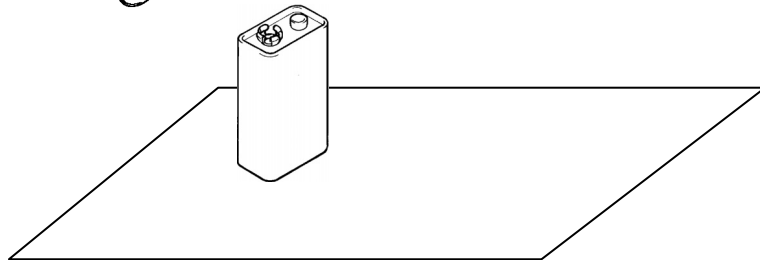
| SECTION A | | For the Examiner | |
|------------------------|---|------------------|-------|
| No. of Questions | | Mark | Total |
| | x | 4 | |
| | x | 3 | |
| | x | 2 | |
| | x | 1 | |
| | x | 0 | |
| | x | / | |
| Total (32) | | Total 1: | |
| Disallowed | | Mark | Total |
| | x | 4 | |
| | x | 3 | |
| | x | 2 | |
| | x | 1 | |
| Total (max 7) | | Total 2: | |
| Section A Total (1-2): | | | |

1. Name the type of drawing shown.

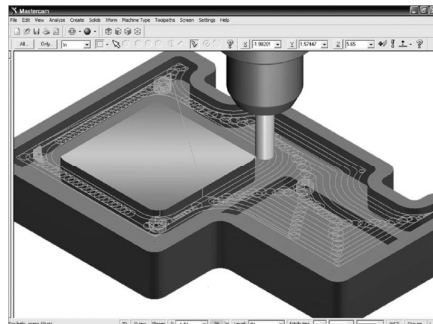


Answer: _____

2. Use **two** rendering techniques on the sketch shown to suggest a light source at **X**.



3. State **two** advantages of using CAM to produce component parts.



(i): _____

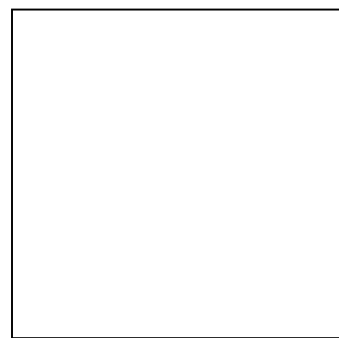
(ii): _____

4. State **one** function of an *icon* in a graphic user interface.

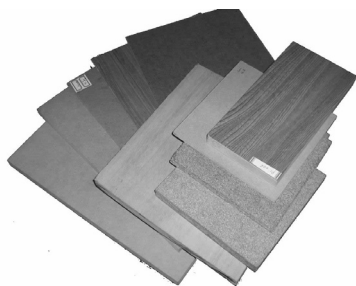


Function: _____

5. Sketch the safety sign for an 'Electrical Hazard' in the space provided.



6. State **one** advantage and **one** disadvantage of using a manufactured board to make a project.



Advantage: _____

Disadvantage: _____

7. State **two** hazards associated with using a jig saw.



(i): _____

(ii): _____

8. Name the alloy produced by combining the following metals:

(i) Copper and Zinc,

and

(ii) Tin and Lead.



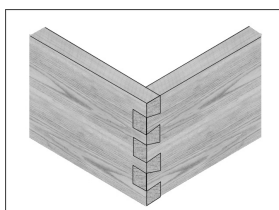
(i) Copper and Zinc.

Alloy: _____

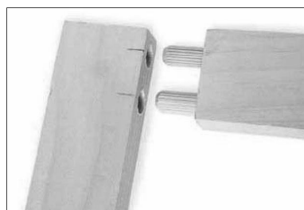
(ii) Tin and Lead.

Alloy: _____

9. Name the wood-joint shown at (i) and at (ii).



(i)



(ii)

(i): _____

(ii): _____

10. Name **one** natural fabric

and

one synthetic fabric

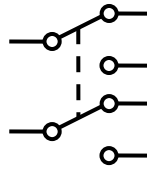
used to manufacture clothing.



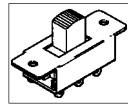
Natural fabric: _____

Synthetic fabric: _____

11. The symbol for a DPDT switch is shown.



Explain the abbreviation 'DPDT'.



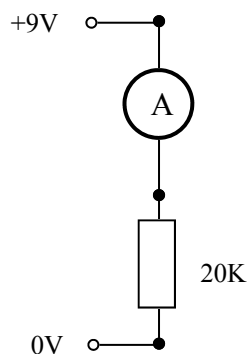
DPDT: _____

12. State the function of the tool shown.



Function: _____

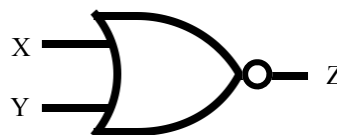
13. Calculate the current measured at A in the circuit shown.



Current: _____

14. The symbol for a NOR gate is shown. (OR followed by NOT)

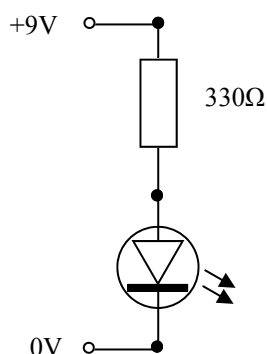
Complete the truth table for the inputs shown.



| X | Y | Z |
|---|---|---|
| 1 | 1 | |
| 0 | 1 | |

15. When connecting an LED to a 9V supply a 330Ω resistor is used.

Explain why the resistor is required.



Answer: _____

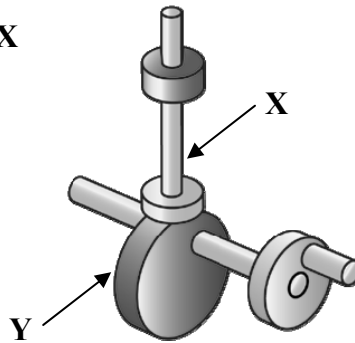
16. State **one** advantage and **one** disadvantage of using a chain drive in a mechanism.



Advantage: _____

Disadvantage: _____

17. Name the parts labelled **X** and **Y** of the mechanism shown.



X: _____

Y: _____

18. State the purpose of the bit shown.

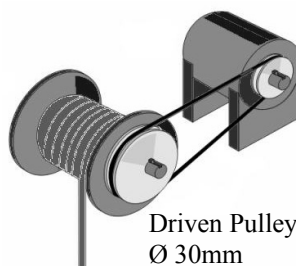


Purpose: _____

19. Indicate clearly the location of the Load (**L**), Effort (**E**) and Fulcrum (**F**) on the nutcracker shown.



20. Calculate the speed of the driven pulley from the information given.



Driver
Ø 15mm
150 RPM

Driven Pulley
Ø 30mm

Speed (RPM): _____

21. Outline **two** reasons why LED lights are replacing older light bulbs in homes.



(i): _____

 (ii): _____

22. In relation to technology tasks, state **two** reasons why it is important to undertake 'Testing and Evaluation' of the completed product.

 **Coimisiún na Scrúduithe Stáit**
 State Examinations Commission

Junior Certificate Examination 2015

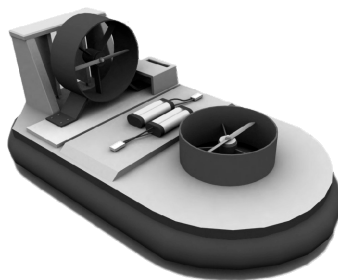
Technology

Design Tasks

(i): _____

 (ii): _____

23. Explain why **two** motors are used in the toy hovercraft shown.



Answer: _____

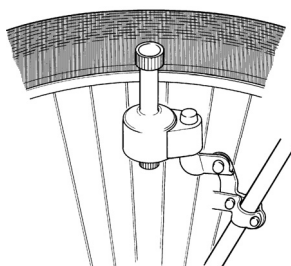
24. State **one** advantage and **one** disadvantage of using electronic tablets in schools.



Advantage: _____

 Disadvantage: _____

25. Name **two** energy conversions taking place in the bicycle dynamo (generator) shown.



(i): _____

 (ii): _____

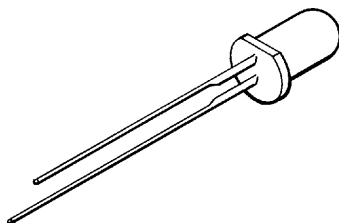
26. State **one** advantage and **one** disadvantage of the two-wheel barrow design shown, as compared with a single-wheel barrow.



Advantage: _____

Disadvantage: _____

27. Name the **two** features of an LED which identify the cathode (negative leg).



(i): _____

(ii): _____

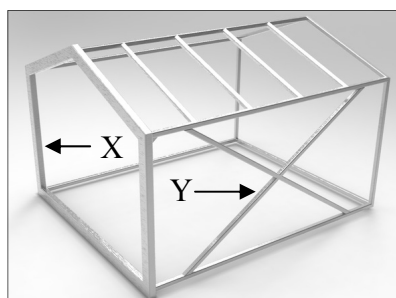
28. Name **two** appliances found in the home that use wireless technology.



(i): _____

(ii): _____

29. Name the forces acting on the members labelled **X** and **Y**.



X: _____

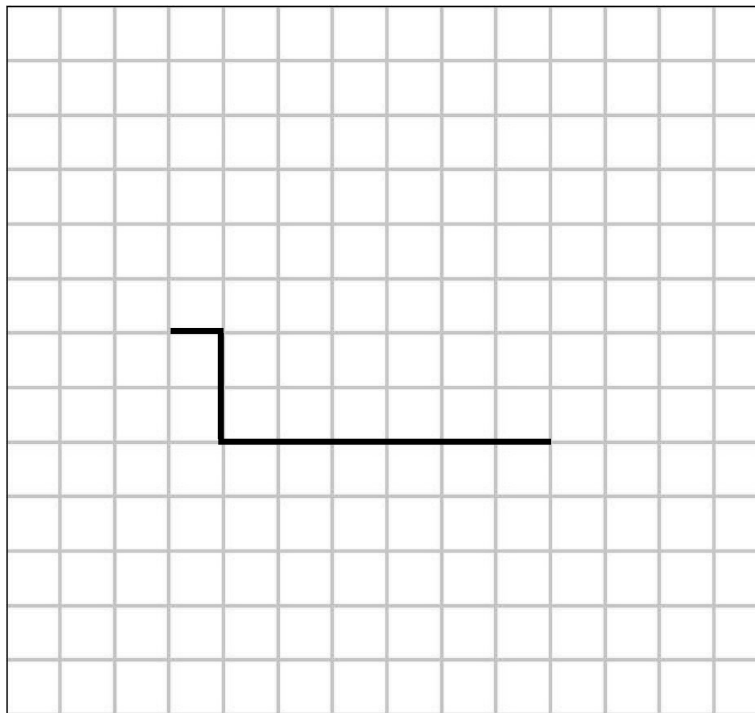
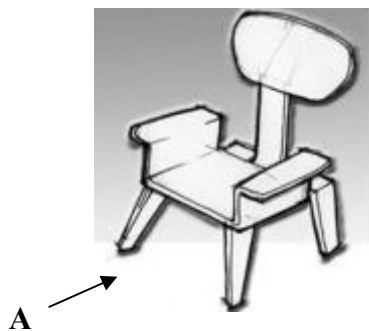
Y: _____

30. Describe how the four 1.5V batteries should be connected to produce a total voltage of 6V.

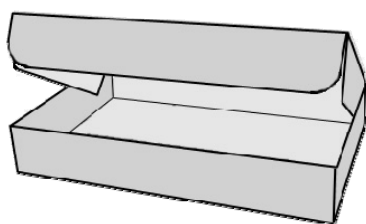


Answer: _____

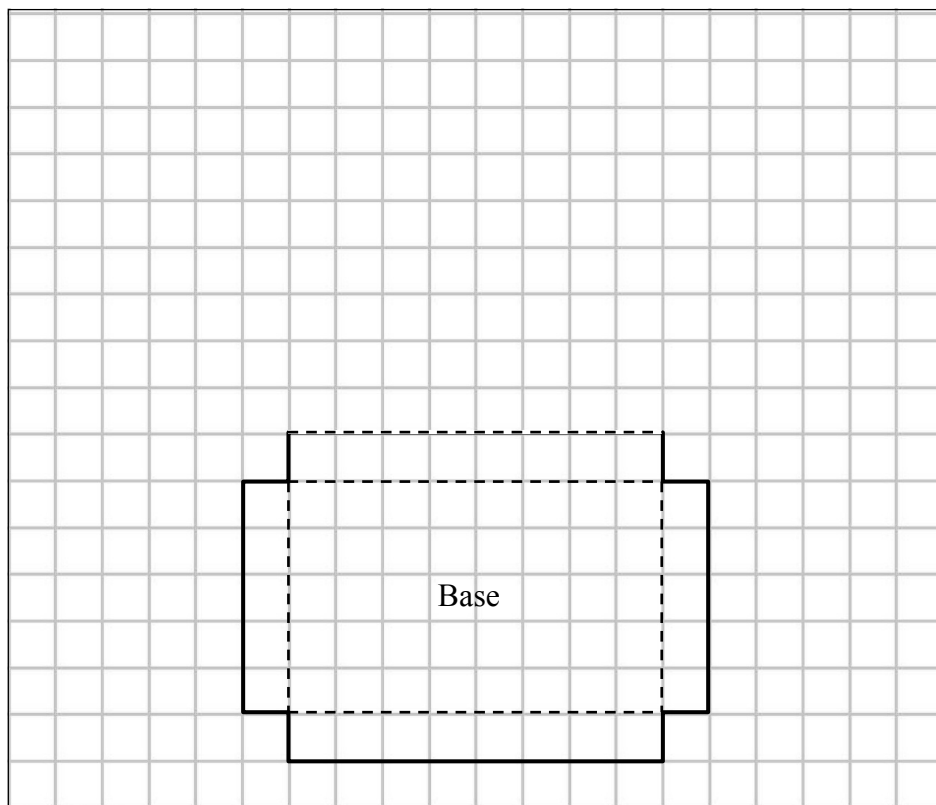
31. An isometric sketch of a chair is shown.
On the grid provided, complete the front elevation of the chair when viewed in the direction of arrow A.



32. On the grid provided, complete the development of the food container shown.



Food container





Junior Certificate Examination, 2015

Technology

Higher Level

Wednesday, 17 June
Afternoon, 2:00 - 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 graphic shows a design for a toy car. The body is made from $200 \times 50 \times 50$ mm red deal.



(i) Make well-proportioned sketches of the following views:

1. An **elevation** in the direction of arrow **X**.
Note: The driver and steering wheel need not be shown.
2. A **plan** in the direction of arrow **Y**.

(10 marks)

- (ii)
1. A hollow space is required, under the body of the car to hold a battery, motor and gear box.
Describe, using suitable sketches, how this space could be formed.
Name any tools required and state the processes used.
 2. If the aerofoils were made from acrylic instead of wood, describe how smooth edges could be created on the acrylic.

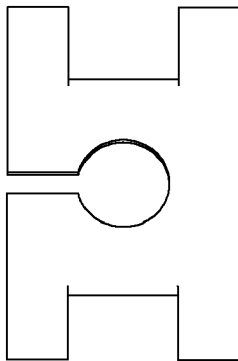
(10 marks)

- (iii) Outline **two** processes which might be used to finish the toy car to a standard similar to that shown in the graphic.

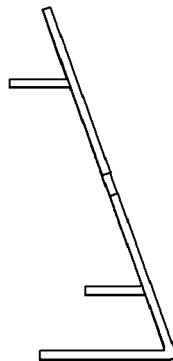
(5 marks)

- OR -

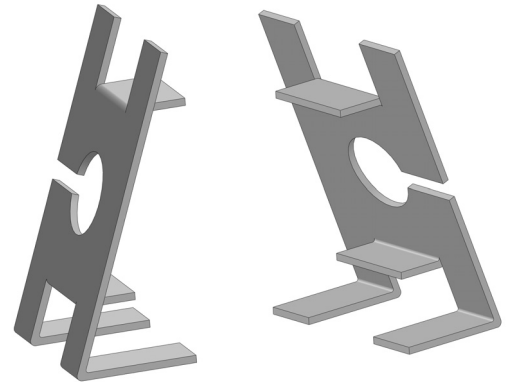
- 1 (b) The graphics show a design for a night stand/charger holder for a smart-watch. The stand is to be manufactured from a single sheet of 3 mm acrylic.



Elevation



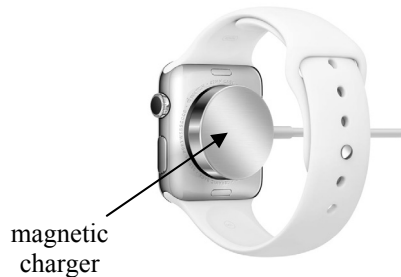
End View



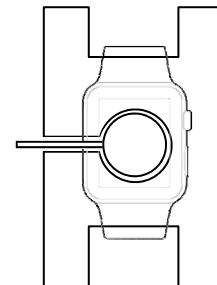
Pictorial Views



Pictorial view of smart-watch



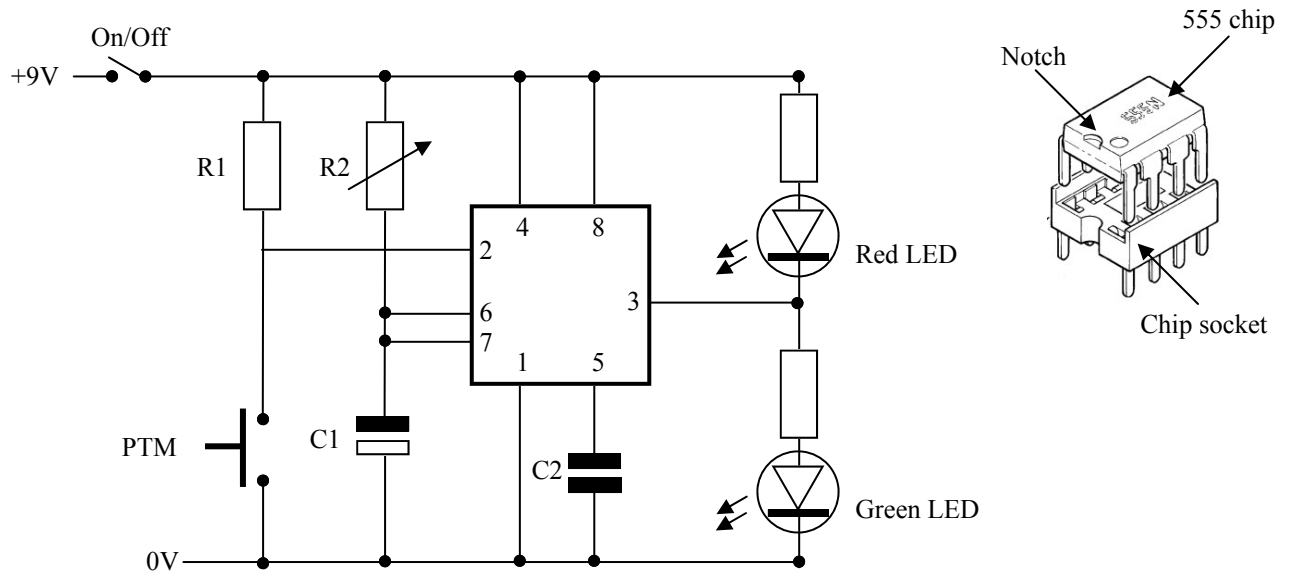
View showing magnetic charger attached to watch



Elevation of stand showing watch and charger

- (i) Make a well-proportioned sketch of a **development** of the stand. Indicate clearly on your sketch the position of all cutting and bend lines. (10 marks)
- (ii) 1. Explain, using sketches, the steps required to manufacture the stand from the acrylic sheet. *Name any tools required and state the processes used.*
2. Describe how smooth edges could be created on the acrylic stand. (10 marks)
- (iii) A modification is required to keep the charger securely in place on the stand when the watch is removed. Describe, using sketches, a design modification to solve this problem. (5 marks)

- 2 (a) In order to help conserve water use in a shower, the 555 timer circuit shown will be used to indicate that 4 minutes have passed. The timing circuit, when started by pushing the PTM switch, will turn on the green LED for 4 minutes and after that time will turn on the red LED.

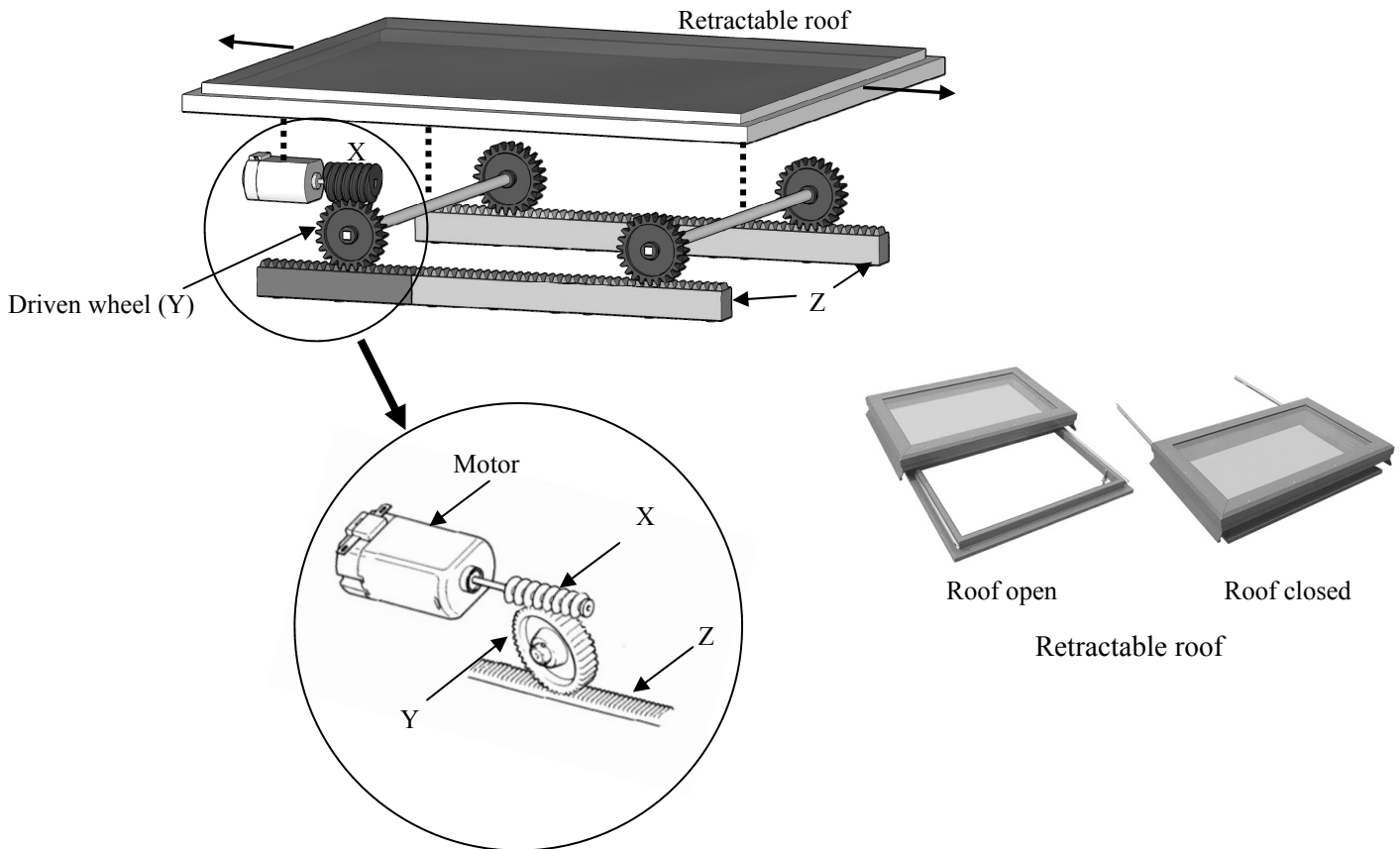


- (i) Explain the purpose of the notch on the 555 chip.
- (ii) Explain why the use of a chip socket is recommended when soldering this circuit.
- (iii) State **two** advantages of using a printed circuit board over copper stripboard to make this circuit.
- (iv) Explain the difference between the **On/Off** and **PTM** switches.
- (v) How could the 4 minute time delay be increased?
- (vi) What change could be made to the circuit to produce a sound after the 4 minutes have passed?

(25 marks)

- OR -

- 2 (b) The graphics show a mechanism to open and close a retractable roof. The motor and the gears (X and Y) are attached to the retractable roof. The roof and motor mechanism move along the toothed track Z when opening or closing.



- (i) Name the parts of the mechanism shown at X and at Z.
State **one** advantage of using this mechanism to open and close the roof. (10 marks)
- (ii) The roof rests on four gear wheels, one of which (Y) is driven by the motor. Sketch and name a suitable mechanism to link *all four* gear wheels such that they are all driven by the single motor. (5 marks)
- (iii) Use the following information to calculate the speed at which the roof moves:
- motor speed: 45 RPM
gear wheel Y: 30 teeth
toothed track Z : 5 teeth/cm. (5 marks)
- (iv) Sketch and name the component parts of a suitable alternative mechanism to open and close the roof. (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

- (a) For any **two** of the following:

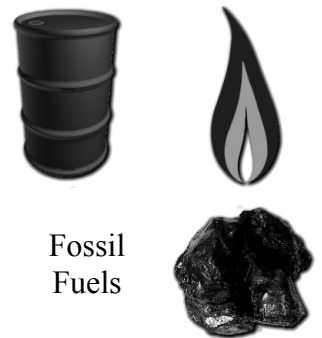
medicine, sport, commerce, entertainment (music or film)

outline **two** developments in those areas which have been influenced by recent changes in technology.

(20 marks)

- (b) ‘The majority of Irish energy needs are met from fossil fuels and these are finite resources’.

- (i) Outline **two** reasons why we should be concerned about the use of our fossil fuels.
- (ii) Outline **two** alternative energy sources available for energy production in Ireland.



Fossil
Fuels

(20 marks)

- (c) ‘Many of the foods which are available in our supermarkets have benefited from modern technologies’.

Using **one** named example in **each** case, outline how new technologies have changed the following:

food production, food processing and food storage.



(10 marks)

4. Control Systems & Technology and Society



(a) In the case of **each** of the following:

driverless cars and unmanned aerial vehicles (drones).



- (i) Outline how 'input sensors' are used in their operation.
- (ii) Outline **one** advantage and **one** disadvantage in developing these technologies.
- (iii) In **both** cases, outline why control systems are required for their operation.

(30 marks)

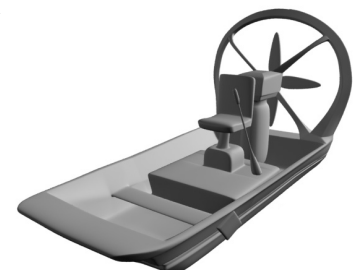
(b) Robotic devices are commonly used on factory production lines.

- (i) Outline **two** advantages of using robots in this situation.
- (ii) Explain, giving **two** reasons, why robotic manufacturing is more commonly used in first world countries.

(20 marks)

5. Design and Manufacture

A student intends to manufacture a toy airboat with a flat hull, based on the design shown.



- (a) (i) Describe, with the aid of sketches, the steps required to manufacture the hull of the boat from a suitable material.
Name any tools required and state the processes used.
- (ii) Outline **two** safety features which should be included in the design of the airboat.
- (iii) Describe, with the aid of sketches, how the fan and motor assembly could be attached to the hull of the boat.

(30 marks)

- (b) (i) Describe, with the aid of sketches, how you would construct a drive system (motor, gear train and propeller) to produce the highest possible output speed from the following components:

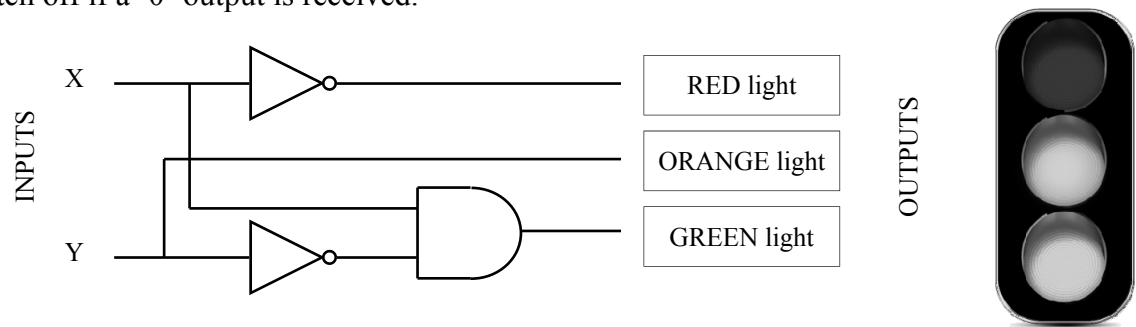
| Motor | Propeller | Axle | 2×40 tooth gears | 2×10 tooth gears |
|-------|-----------|------|---------------------------|---------------------------|
| | | | | |

- (ii) If the motor turns at 100RPM, calculate the speed of the propeller for the gear arrangement you have shown.

(20 marks)

6. Control Systems

- (a) A system diagram to control a set of traffic lights is shown.
A coloured light will switch on if a '1' output is received from the system and will switch off if a '0' output is received.

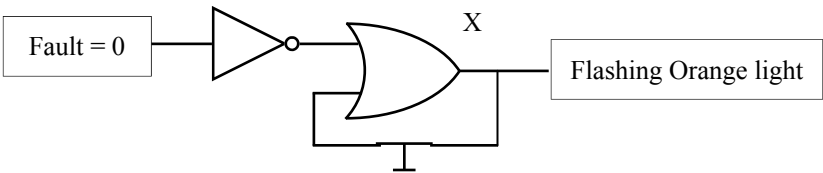


- (i) Copy the truth table below into your answerbook.
Complete the table to indicate which lights will be switched on/off for each input shown.

| X | Y | Red | Orange | Green |
|---|---|-----|--------|-------|
| 1 | 1 | | | |
| 1 | 0 | | | |
| 0 | 1 | | | |
| 0 | 0 | | | |

(20 marks)

- (ii) The system diagram below is used to activate a flashing orange light if a fault develops in the traffic light system at (a) above.



Name the special arrangement of gate shown at X and explain why the PTB switch is used with this arrangement.

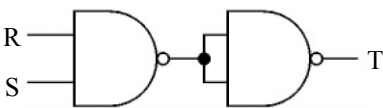
(10 marks)

- (b) A NAND gate is a combination of an AND gate and a NOT gate.
NAND gates can be combined to form other logic gates.

Using a truth table in each case, identify the gates produced by the NAND gate combinations shown.

(20 marks)

(i)



(ii)

