



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.

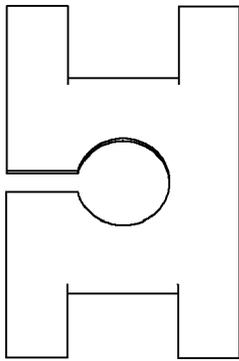
1 (a) The graphic shows a design for a toy car. The body is made from $200 \times 50 \times 50$ mm red deal.



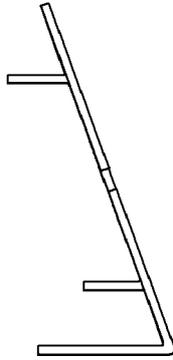
- (i) Make well-proportioned sketches of the following views:
1. An **elevation** in the direction of arrow **X**.
Note: The driver and steering wheel need not be shown.
 2. A **plan** in the direction of arrow **Y**. (10 marks)
- (ii)
1. A hollow space is required, under the body of the car to hold 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 -

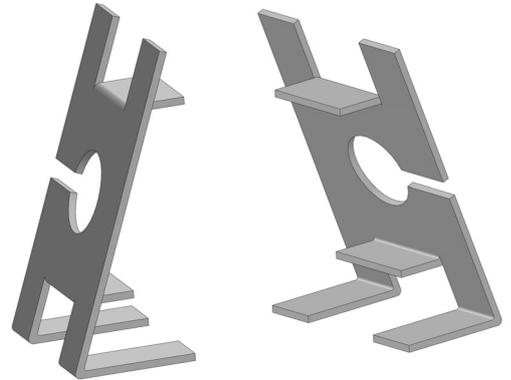
- 1 (b) The graphics show a design for a night stand/charger holder for a smart-watch. The stand is to be manufactured from a single sheet of 3 mm acrylic.



Elevation



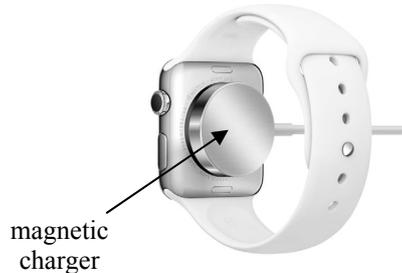
End View



Pictorial Views

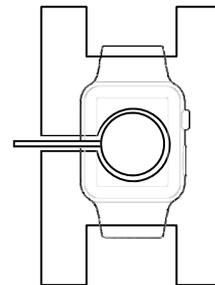


Pictorial view of smart-watch



magnetic charger

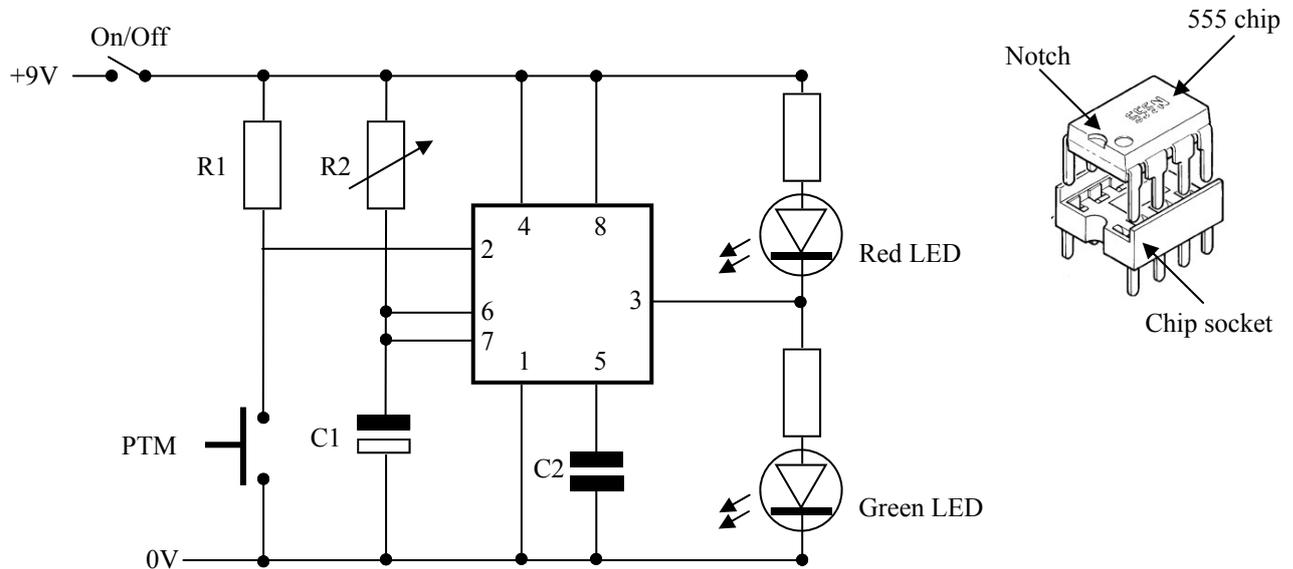
View showing magnetic charger attached to watch



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.

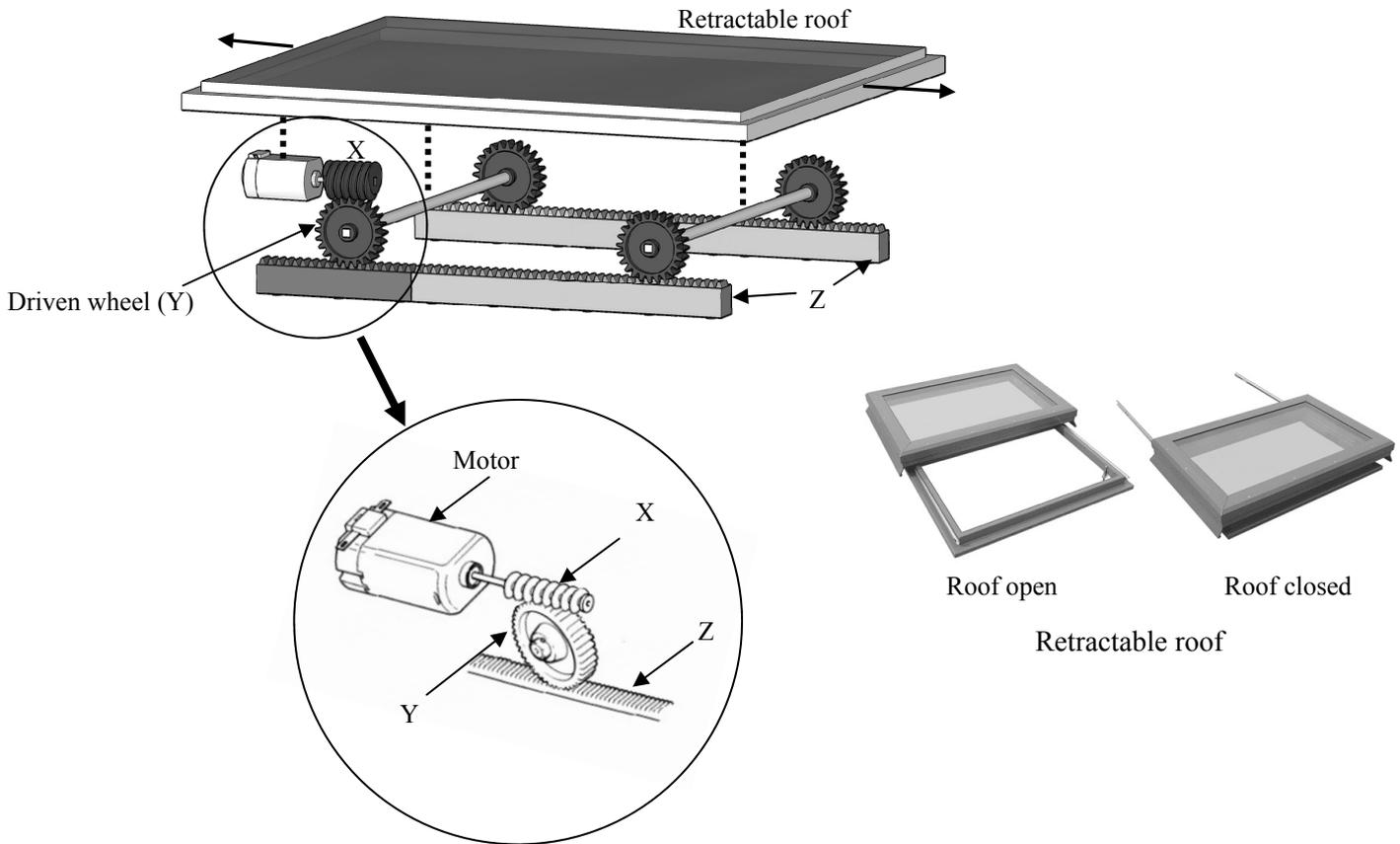


- (i) Explain the purpose of the notch on the 555 chip.
- (ii) Explain why the use of a chip socket is recommended when soldering this circuit.
- (iii) State **two** advantages of using a printed circuit board over copper stripboard to make this circuit.
- (iv) Explain the difference between the **On/Off** 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:

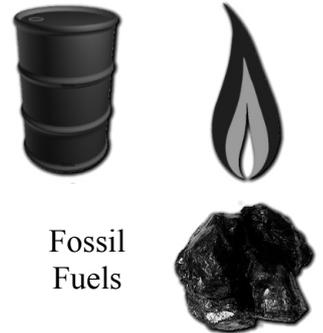
medicine, sport, commerce, entertainment (music or film)

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.



(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)

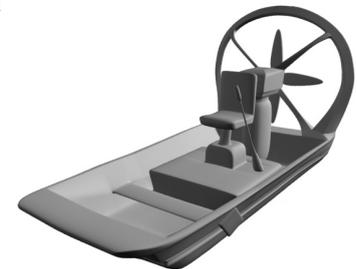
(b) Robotic devices are commonly used on factory production lines.

- (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

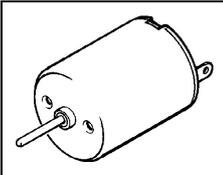
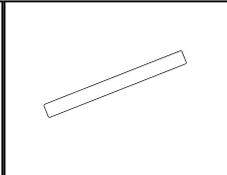
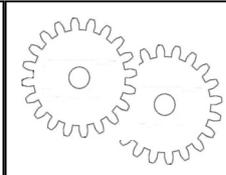
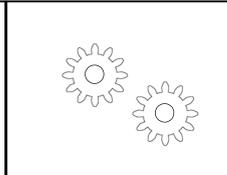
A student intends to manufacture a toy airboat with a flat hull, based on the design shown.



- (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:

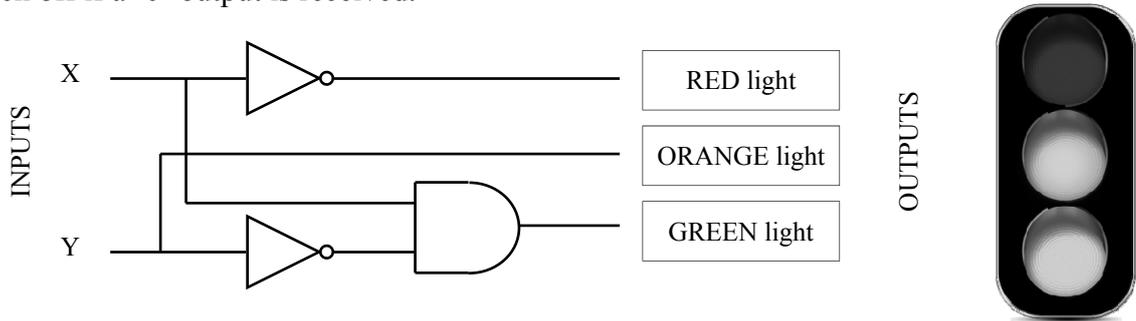
Motor	Propeller	Axle	2 × 40 tooth gears	2 × 10 tooth gears
				

(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.

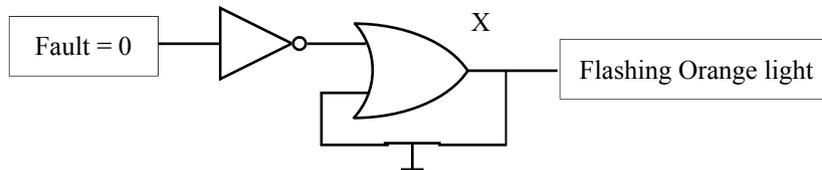


- (i) Copy the truth table below into your answerbook.
Complete the table to indicate which lights will be switched on/off for each input shown.

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.

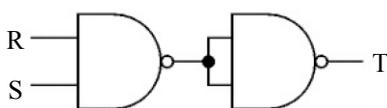
(10 marks)

- (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)

