



Junior Certificate Examination, 2013

Technology

Higher Level

Wednesday, 19 June
Afternoon, 2:00 - 4:00

Section B and Section C

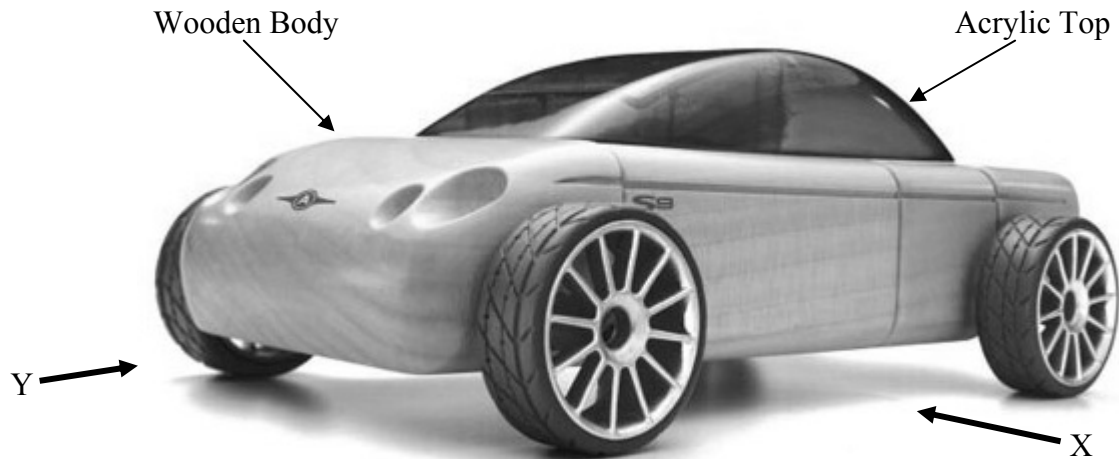
Section B - 50 marks

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.

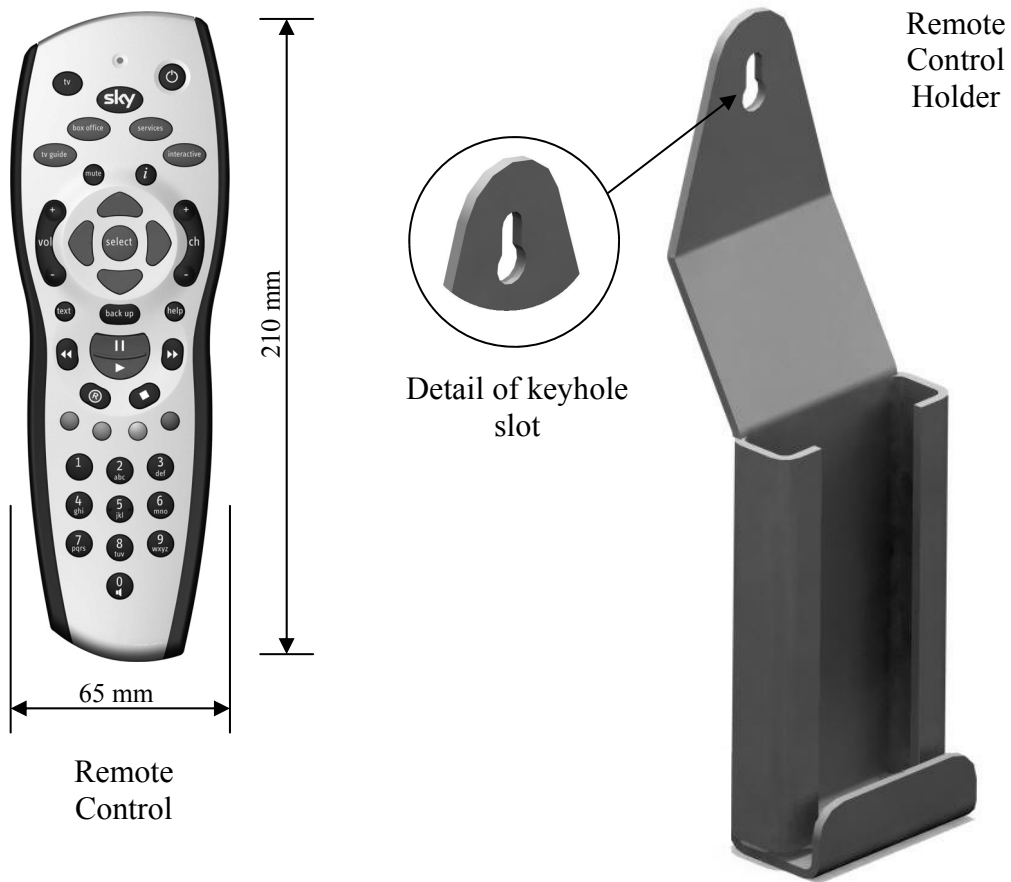
- 1 (a) The graphic shows a toy car. The body is made from 160 x 50 x 30 mm red deal. The top is made from translucent acrylic and can be removed to allow access to a motor and battery.



- (i) Make well-proportioned sketches of the following views:
1. An **elevation** in the direction of arrow **X**.
(The wheels should be shown as circles; omit the spokes)
 2. An **end view** in the direction of arrow **Y**.
- (10 marks)
- (ii)
1. A hollow space needs to be formed in the wooden body of the car to hold a battery and motor. Describe, using suitable sketches, how this hollow space could be formed.
 2. The acrylic top can be easily removed to replace the battery. Describe, using suitable sketches, how the top could be attached and detached from the car.
- (10 marks)
- (iii) Outline **two** processes which might be used to finish the wooden car body to a high standard similar to that shown in the graphic.
- (5 marks)

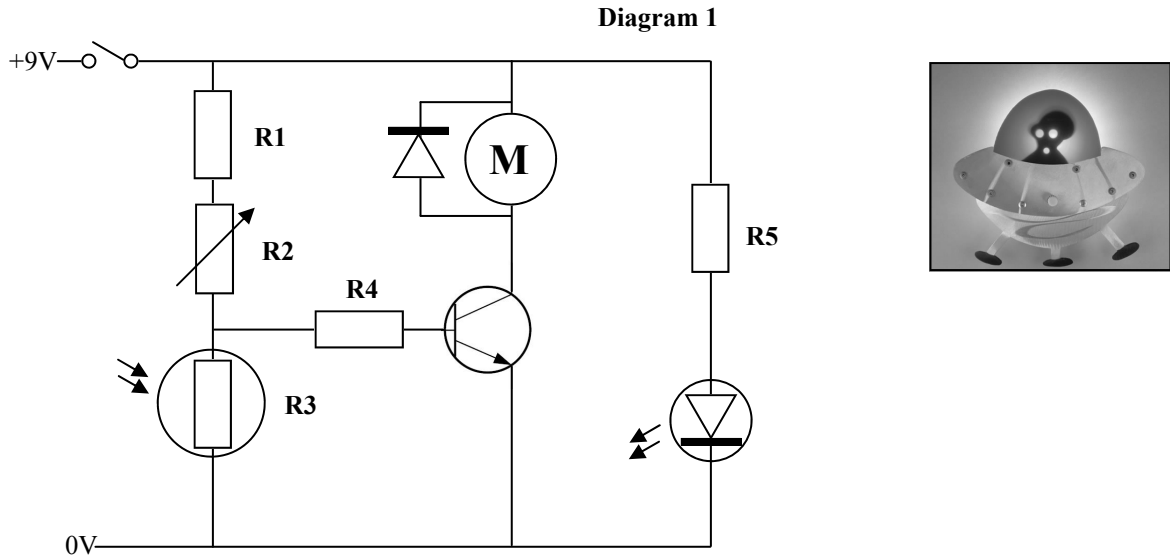
- OR -

- 1 (b) The graphic on the right shows a student design for a wall-mounted remote control holder. The holder is to be manufactured from 3 mm acrylic.

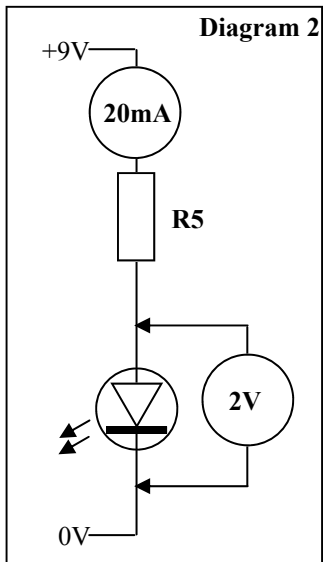


- (i) Make a well-proportioned sketch of a **development** of the holder. Indicate clearly on your sketch the position of all bend lines. (10 marks)
- (ii) 1. Explain, using sketches, how the holder should be manufactured from a sheet of acrylic. (10 marks)
2. Explain, using sketches, how the keyhole slot could be made. Suggest **one** advantage of this kind of slot.
- (iii) Describe, using sketches, how a smooth finish could be achieved on the edges of the acrylic. (5 marks)

2 (a) The graphic shows a motorised night light. Diagram 1 shows an electronic circuit for the night light. The circuit will automatically turn on an LED and motor, to animate the figure in the design, at night.



- (i) Explain the function of the fixed resistor R1 in the potential divider shown.
- (ii) Explain the effect of swapping the positions of R1 and R2 in the circuit.
- (iii) Explain the effect of swapping the positions of R2 and R3 in the circuit.
- (iv) Explain the purpose of the fixed resistor R4 in the circuit.
- (v) All the fixed resistors in the circuit have a gold coloured 4th band printed on them. Explain the meaning of this gold band.

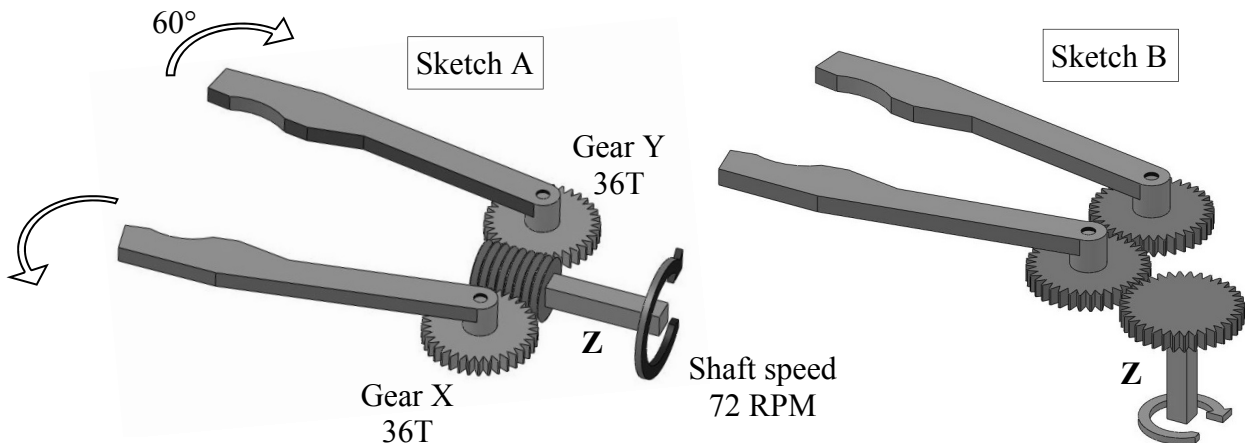


- (vi) Using the information provided in Diagram 2, calculate the required value of resistor R5.

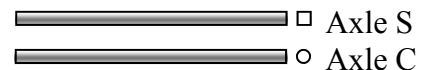
(25 marks)

- OR -

2 (b) The sketches show two possible mechanisms for the operation of a robot claw.



- (i) Name the gear mechanism shown in sketch A.
- (ii) State **two** advantages of using the mechanism in sketch A, over the mechanism in sketch B, to operate a robot claw.
- (iii) Using the information given in sketch A, calculate the time taken for an arm of the claw to move through 60° .
- (iv) Two possible metal axles are available for use at Z:
Axle S, which has a square cross section and Axle C, which has a circular cross section.
Explain which axle, S or C, is the better choice for use in the robot claw.
- (v) Outline a system which will prevent the claw from continuing to close on an object, once the object has been held by the claw.



(25 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) Modern cars have changed dramatically since they were first introduced in the early 1900's.
- (i) Explain, using **three** examples, the environmentally friendly features available in modern cars.
- (ii) Outline the operation of **any two** of the following technologies in modern cars:
- Air bags
 - Bluetooth connectivity
 - Keyless entry.

(20 marks)

- (b) (i) Outline, using **two** examples, how technology has changed the way in which information is transmitted around the world.



- (ii) Outline the role of **any two** of the following in the development of new communications technologies:

- Designers
- Engineers
- Programmers.

(20 marks)

- (c) Outline, using **two** examples, the alternative energies available in Ireland to replace fossil fuels.

(10 marks)

4. Control Systems & Technology and Society

Modern manufacturing industries commonly use industrial robots.



- (a) (i) Suggest **two** advantages of using robots in industry.
- (ii) Suggest **two** disadvantages of using robots in industry.
- (iii) Outline **two** areas, other than the manufacturing industry, where robots are used and explain their function in each.
- (iv) Explain why computers are necessary to operate robotic devices.
- (v) In relation to computers explain the terms: CPU and RAM.

(36 marks)

(b) Modern farming in Ireland is highly mechanised.

- (i) Outline **two** examples of this mechanisation.
- (ii) In relation to modern farming, explain the term ‘GM crops’.

(14 marks)

5. Design and Manufacture

A student is required to manufacture a toy tipping-truck based on the design shown.



- (a) (i) Describe, with the aid of sketches, the steps required to manufacture a suitable tipping body. Name the materials, tools and processes used.
- (ii) Outline **two** safety features which should be included in the design of the toy.
- (iii) Explain, giving **two** reasons, why plastics have almost completely replaced wood and metal in the manufacture of toys.

(30 marks)

(b) (i) Outline, with the aid of sketches, a suitable motorised mechanism to raise and lower the tipping body.

- (ii) Outline where limit switches could be included in your suggested mechanism.

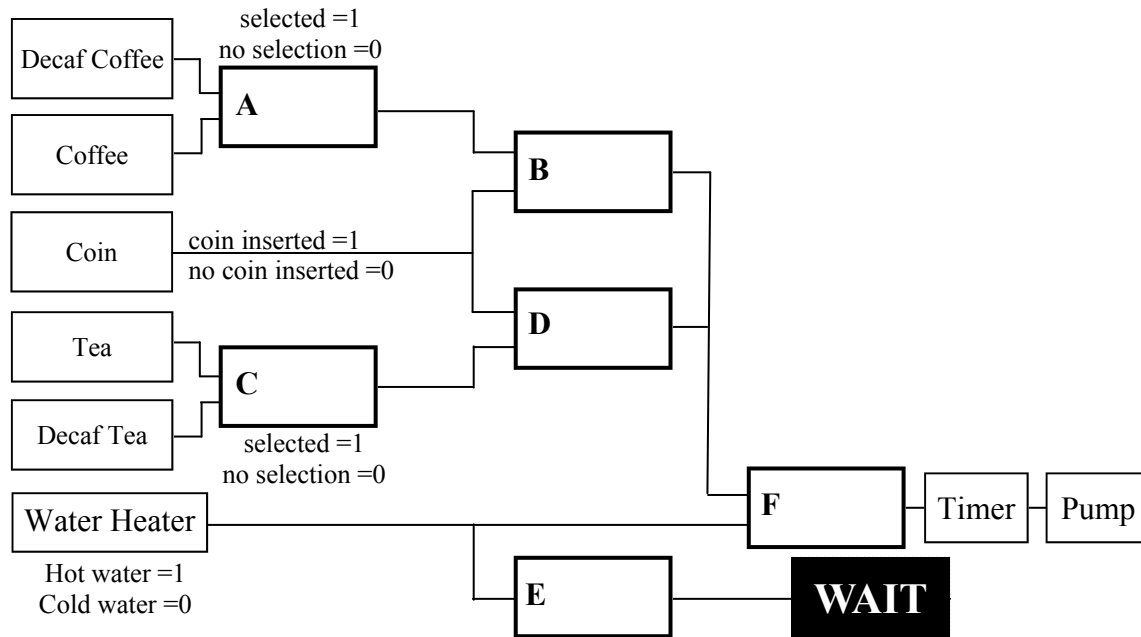
(20 marks)

6. Control Systems

The graphic shows a tea and coffee dispensing machine. Drinks are dispensed if a coin is inserted in the machine and either coffee or tea is selected.

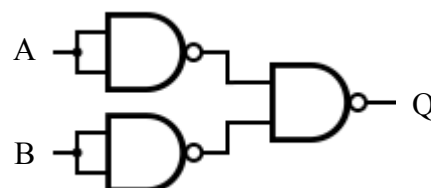


The student-designed system shown below is intended to control the dispenser. A pump will add hot water to a paper cup containing tea or coffee only if the correct coin is inserted and the water is hot. A 'WAIT' sign is lit if the water is cold.



- (a) (i) Name the logic gates required at A, B, E and F.
- (ii) Sketch truth tables for gates B and E.
- (iii) Explain why a 'timer' is required in the system.
- (iv) Name the component required to detect hot water.
- (30 marks)
- (b) Outline how the system could be modified to include the following:
- Illuminate a 'Service Required' sign if the dispenser has;
- (i) no stock of paper cups *or*
- (ii) has no water to heat.
- (10 marks)
- (c) All of the logic gates above can be constructed from NAND gates.

Using a truth table, determine the type of logic gate which has been constructed from the NAND gate arrangement shown.



(10 marks)