



Junior Certificate Examination, 2009

Technology

Higher Level

Wednesday 17 June
Afternoon, 2.00 - 4.00

Section B and Section C

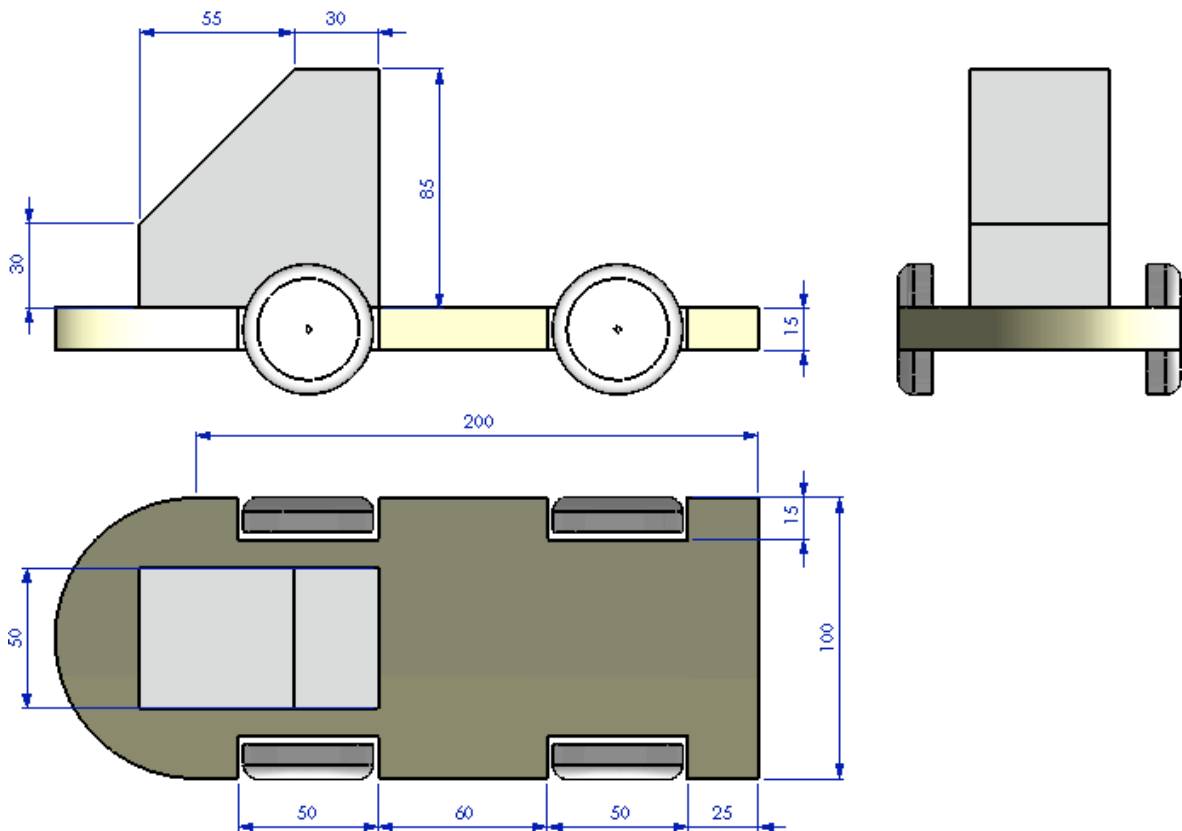
Section B - 50 marks

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 sketch shows a plan, elevation and end view of a student design for a child's toy.



All dimensions are in millimeters

- (i) Sketch a well proportioned isometric view of the toy on isometric grid paper. The wheels can be omitted from the sketch. Include **three** overall dimensions on your sketch.

10 marks

- (ii) 1. Name the tools and describe the processes required to shape and finish the base of the toy from a sheet of named material of your choice.
2. Name the tools and describe the processes required to attach the wheels to the base of the toy.

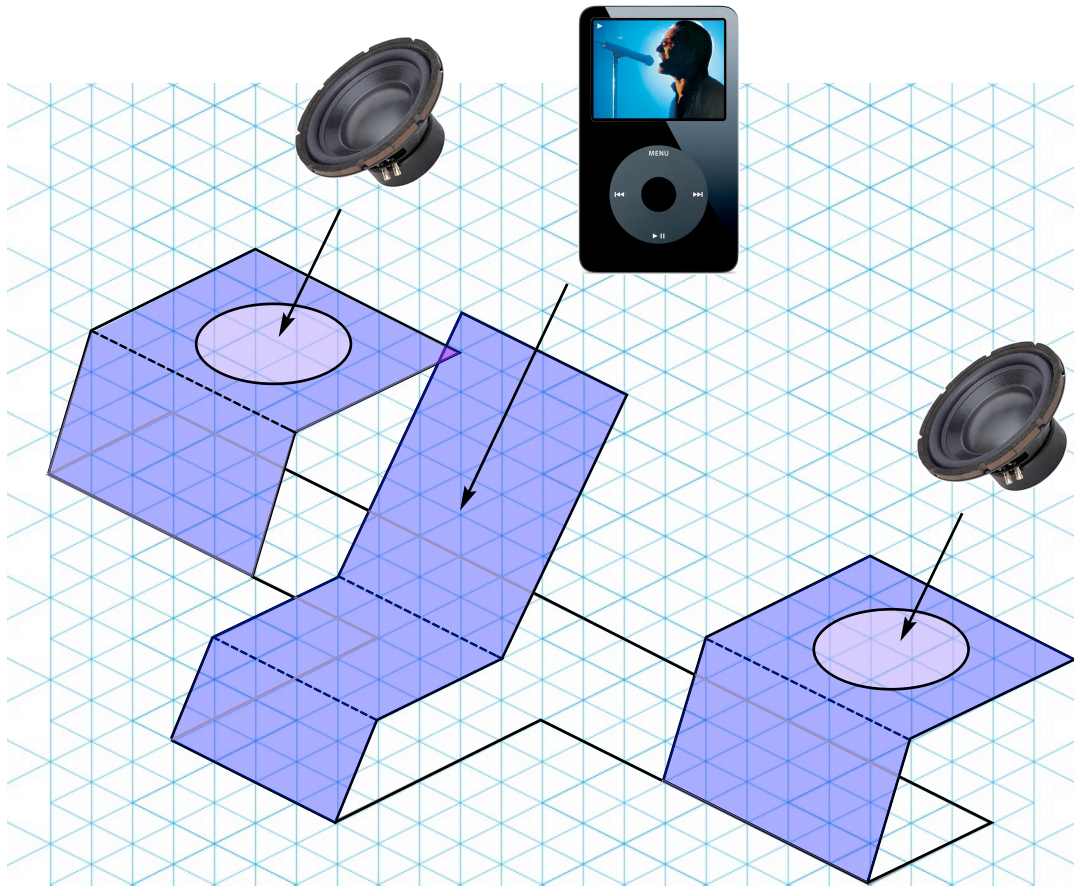
10 marks

- (iii) Sketch **two** safety features which should be included in this student design.

5 marks

- OR -

- 1 (b) The sketch shows a student design of a desktop holder for an MP3 player using recycled speakers. The holder will be manufactured from a single sheet of acrylic.

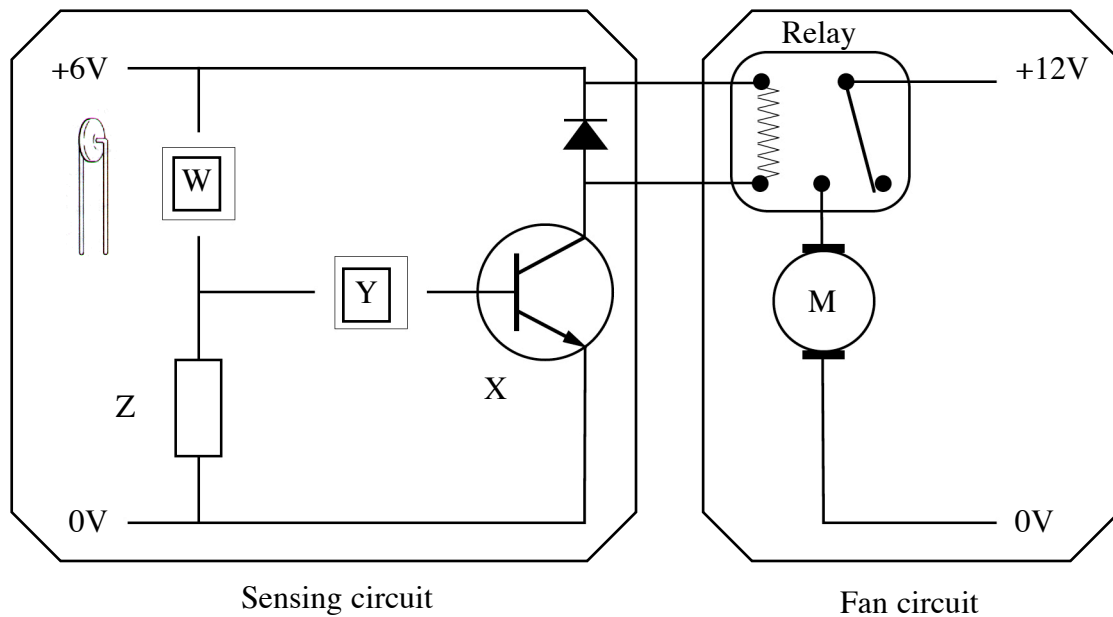


- (i) Using suitable proportions, sketch a development of the material required to manufacture the holder from a single sheet of acrylic. Indicate clearly all bend lines and show the cut outs for the speakers.
- (ii)
1. Name the tools and describe the processes required to form the acrylic into the shape shown.
 2. Name the tools and describe the processes required to produce the cut outs for the speakers in the acrylic.
 3. Sketch a suitable modification to the design to prevent the MP3 player falling from the supporting platform.

10 marks

15 marks

- 2 (a) The circuit shown is designed to automatically turn on a 12V fan motor if high temperatures are detected by a sensing circuit.

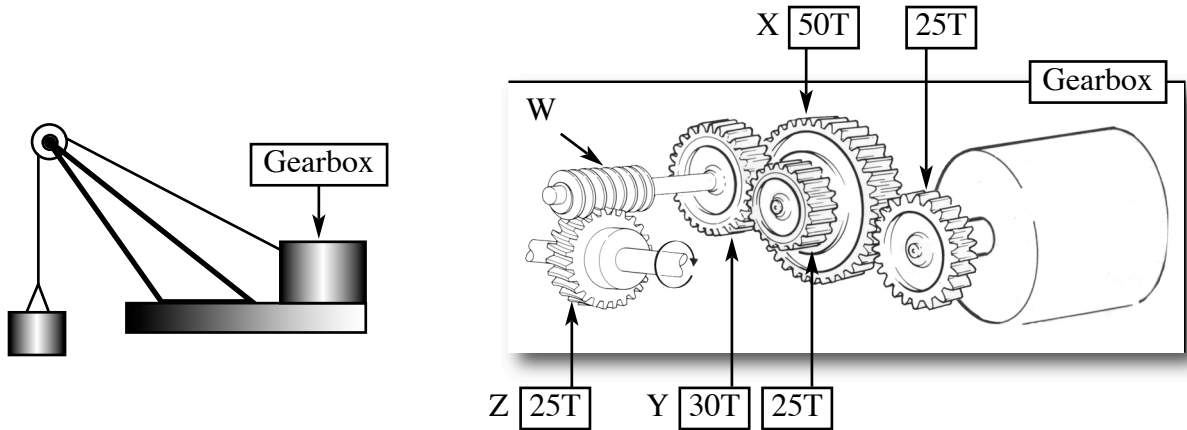


- (i)
1. Sketch the electronic symbol for the thermistor 'W'.
 2. Explain the function of the transistor 'X' in the circuit.
 3. Name the missing component required at 'Y' in the circuit.
 4. Resistor 'Z' has a gold fourth band.
What information does this provide about the resistor 'Z'?
 5. Explain why a variable resistor is a recommended replacement for resistor 'Z'.
- (ii)
- Copy the sensing circuit diagram above into your answer book.
1. Sketch a modification to the circuit to show the symbol and the most suitable location of an on/off switch for the sensing circuit.
 2. Sketch a modification to the circuit to show the symbol and location of a green LED and a series resistor which will indicate that a working 6V battery is connected to the sensing circuit.
 3. Sketch a modification to the circuit to show the symbol and location of a red LED and a series resistor which will indicate that a high temperature has been detected by the sensing circuit.
 4. What is the function of the series resistor in the LED circuits?

25 marks

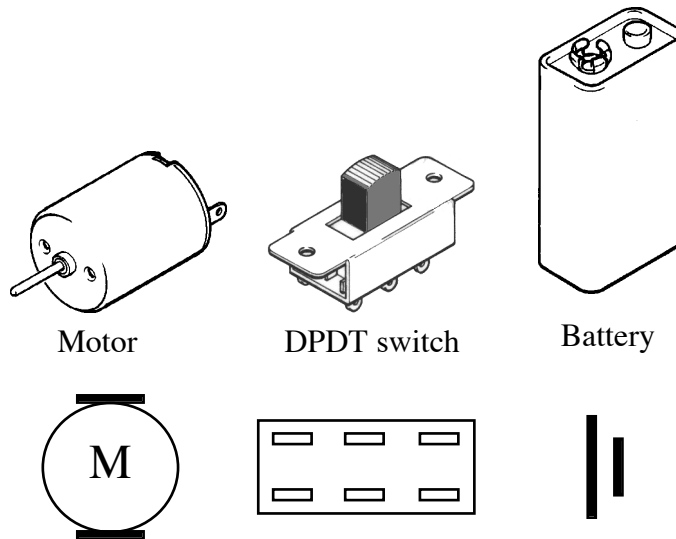
- OR -

2 (b) The sketch shows the gearbox arrangement in a lifting crane.



- (i)
 1. Name the mechanism attached to the gear train at 'W'.
 2. State **two** advantages to using mechanism 'W' in the lifting crane.
 3. If the motor rotates at 600RPM calculate:
 - (i) the speed of rotation of gear X,
 - (ii) the speed of rotation of gear Y,
 - (iii) the speed of rotation of gear Z.

20 marks



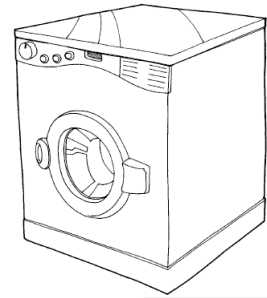
- (ii) Using the symbols for the motor, DPDT switch and battery, indicate how the contacts on the switch should be wired to allow the motor rotate clockwise or anticlockwise.

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

Efficient use of energy has become a concern for home owners.

- (a)
- (i) Describe **one** technological advance which has improved the energy efficiency of household equipment.
 - (ii) Describe **two** environmental concerns associated with the use of plastic components in household equipment.
 - (iii) Describe how technology can address **one** of the concerns outlined in (ii) above.
 - (iv) As consumers we are encouraged to reduce our '**carbon footprint**'. Explain, using suitable examples, the meaning of carbon footprint.

25 marks

Communication and entertainment products have benefited greatly from technological advances.

- (b)
- (i) Outline **two** advanced technologies used in these products.
 - (ii) Many of these products have a short '**life-cycle**'. Explain, using a suitable example, the meaning of product life-cycle.
 - (iii) Outline, giving **two** reasons, why many of the products are regarded as **disposable**.

25 marks

4. Control Systems & Technology and Society



Modern entertainment robots are designed to interact with humans.

- (a) (i) Outline **two** ways in which data can be acquired by an entertainment robot.
- (ii) Explain why the robot response to data input is limited.
- (iii) Explain why **software upgrades** are made available for these robotic toys.

20 marks

Industrial robots require **control software**, a **computer interface** and **feedback sensors**.

- (b) (i) Explain the meaning of each of the terms in **bold** above.
- (ii) State **two** advantages of using CAM in mass production.
- (iii) Explain why pneumatics or hydraulics are commonly used in place of electric motors to move industrial robotic arms.
- (iv) Explain why robotic industrial production lines are more likely to be found in first world countries. Give **two** reasons for your answer.

30 marks

5. Design and Manufacture

A student is required to manufacture a wall mounted night light for a child's room based on the design shown.



- (a) (i) Name a suitable material for the night light and give **two** reasons for your choice.
 - (ii) Describe, with the aid of suitable sketches, the steps required to manufacture the night light from the named material.
Name **three** processes required to manufacture the night light.
- 25 marks
- (b) (i) Sketch a suitable 9V circuit diagram which will light a white LED in any four of the stars on the night light.
 - (ii) Outline, with the aid of suitable sketches, a design for a novelty switch to turn the LED circuit on and off.
 - (iii) Describe, with the aid of suitable sketches, the steps you would take to ensure the night light and circuit are safe for use by a child.

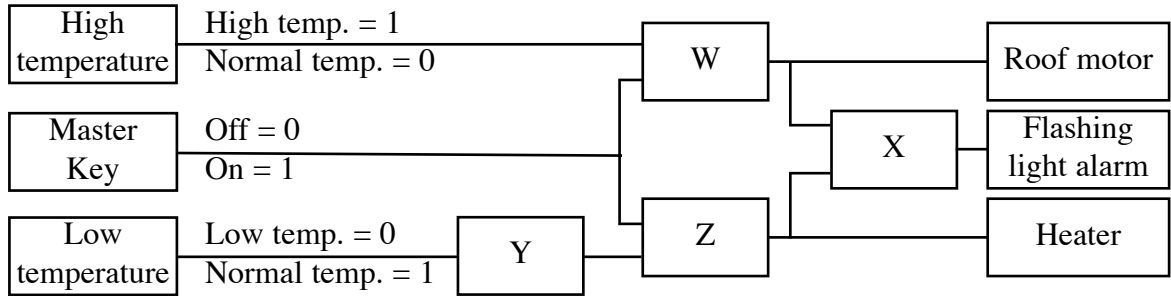
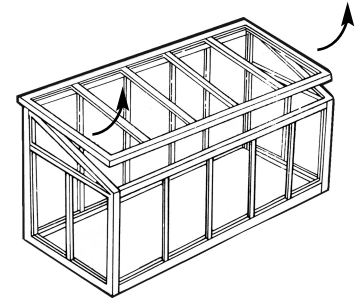
25 marks

6. Control Systems

A control system is required to automatically control the temperature in a greenhouse.

The system will automatically open the roof at high temperatures and close the roof at lower temperatures. At very low temperatures the system will turn on a heater.

The system will operate only when a master switch is turned on.

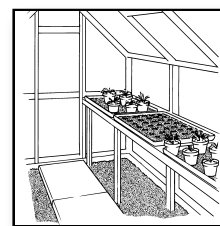
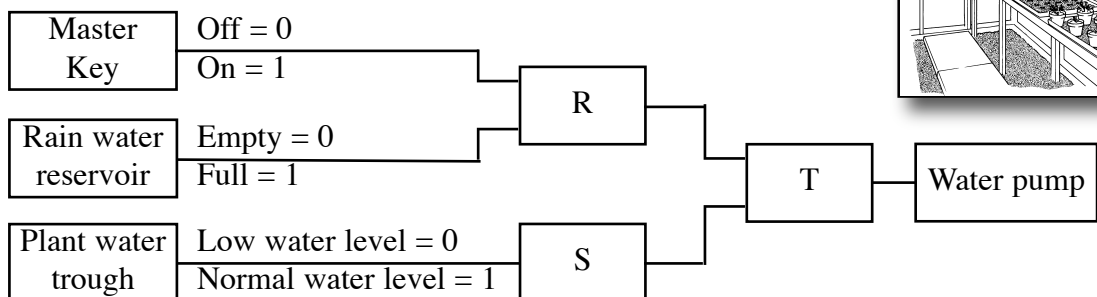


- (a) (i) Identify the logic gates required at W, X, Y and Z.
- (ii) Sketch and complete a truth table for logic gates X and Y.
- (iii) Two '**limit switches**' are required in the design of the roof opening mechanism. Explain why limit switches are required.
- (iv) The control system requires a '**latched**' alarm system (flashing light) for the roof mechanism and for the heater. Explain the term **latch** and outline how a latch can be constructed from a named logic gate.

30 marks

A second system is required to automatically water potted plants in the greenhouse.

The system will pump water from a rain water reservoir to a water trough under the potted plants if low water levels are detected.



- (b) (i) Identify the logic gates required at R, S and T.
- (ii) Sketch a modification to the system shown which will activate an alarm if the reservoir and the water trough are dry. Sketch a truth table for your modification.

20 marks