



Junior Certificate Examination, 2014

Technology

Higher Level

Wednesday, 18 June
Afternoon, 2:00 - 4:00

Section B and Section C

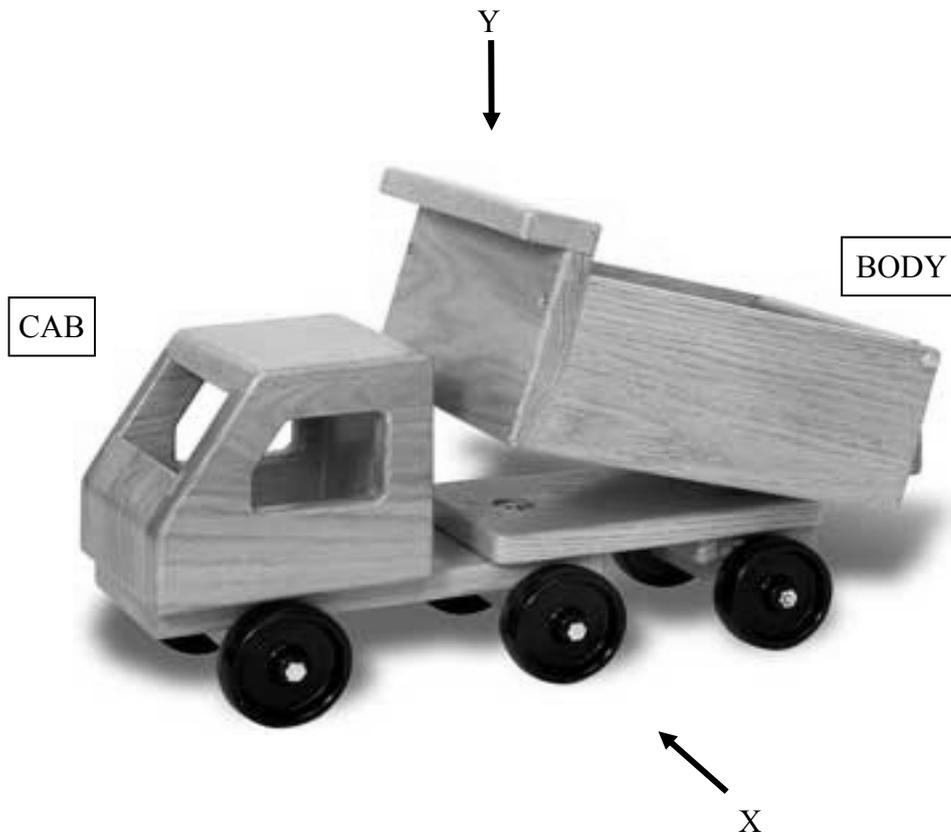
Section B - 50 marks

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.

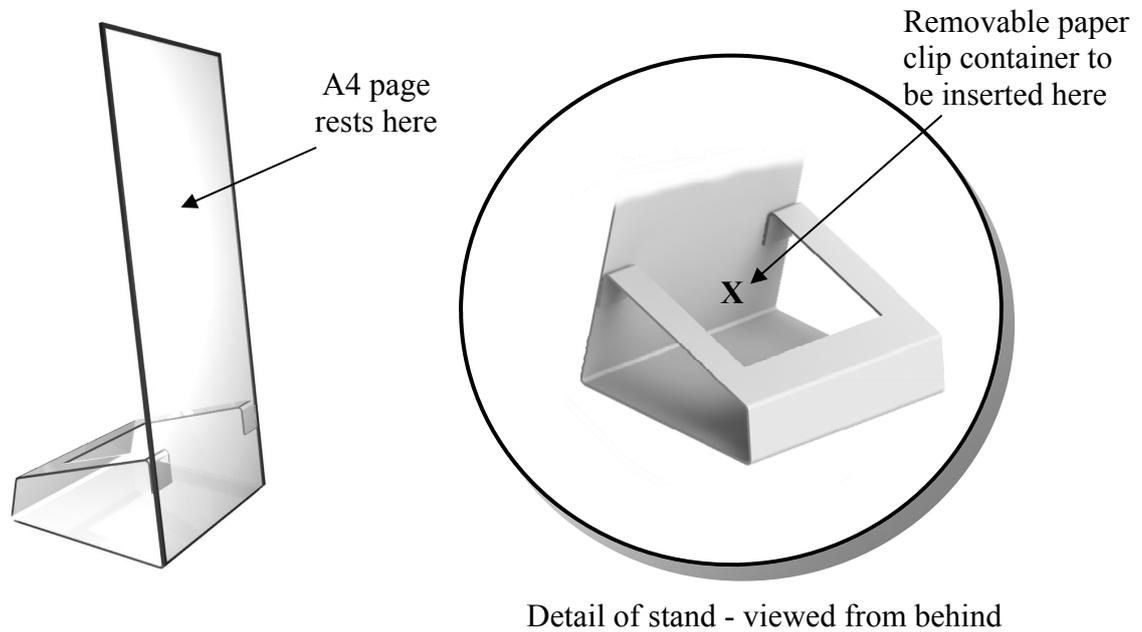
- 1 (a) The graphic shows a toy truck. The cab and body are made from 6 mm thick red deal. The wheels are made from black nylon.



- (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)
 2. A **plan** in the direction of arrow **Y**.
- (10 marks)
- (ii)
1. Describe, using sketches, a suitable method of attaching the wheels to the truck.
 2. Use neat labelled sketches to describe a suitable mechanical method of raising and lowering the body.
- (10 marks)
- (iii) Outline **two** processes which might be used to manufacture and finish the wooden cab to a standard similar to that shown in the graphic.
- (5 marks)

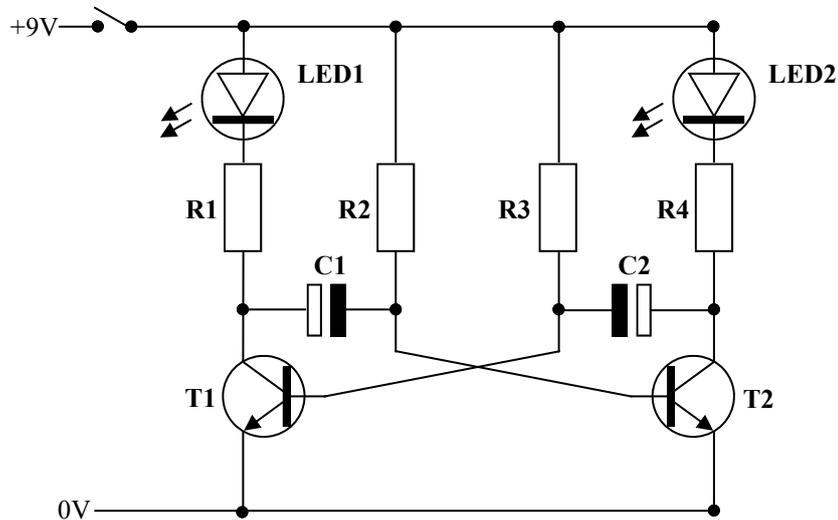
- OR -

- 1 (b) The graphics show a student's unfinished design for a document (A4 page) stand. The stand is to be manufactured from a single sheet of 3 mm acrylic.



- (i) Make a well-proportioned sketch of a **development** of the stand. Indicate clearly on your sketch the position of all bend lines. (10 marks)
- (ii) 1. Explain, using sketches, the steps required to manufacture the stand from the acrylic sheet. (10 marks)
2. Sketch a design for a removable paper clip container to fit in the space labelled X.
- (iii) It was found during testing that A4 pages fell off the stand. Describe, using sketches, a design modification to solve this problem. (5 marks)

- 2 (a) The diagram shows the component layout for a flashing LED circuit.
(LED1 on, LED2 off, LED1 off, LED2 on)



- (i) LED1 has the following values: $V_f = 2V$ and $I_{max} = 0.02A$.
Calculate the required value of R1 in the circuit shown.
- (ii) The required value of resistor R2 is $47k\Omega$.
Use the resistor colour codes shown below to determine the colour bands of this resistor.
- (iii) Identify the components shown at C1 and C2.
What unit is used to measure the value of C1 and C2?
What effect will increasing the value of these components have on the operation of the circuit?
- (iv) Copy the symbol for transistor T1 into your answerbook and indicate clearly the position of the base and the emitter.

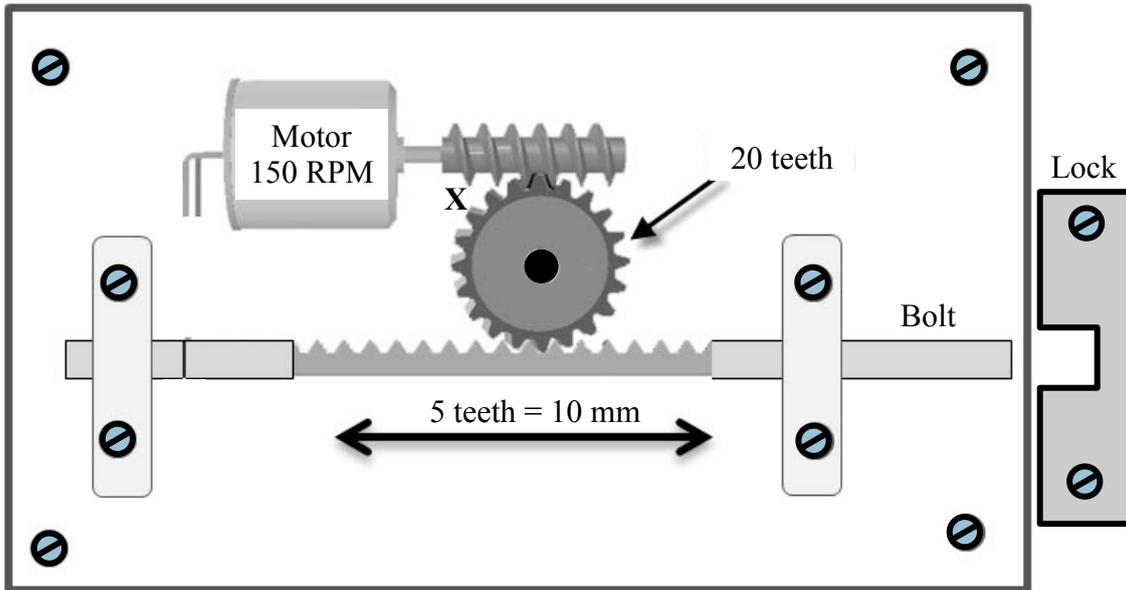
(25 marks)

Resistor Colour Codes

Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Grey	8
White	9

- OR -

2 (b) The sketch shows a mechanism to lock and unlock a door.



- (i) Name the mechanism shown at X.
State **one** advantage of using this mechanism in a lock. (5 marks)
- (ii) The mechanism at X changes the direction of motion through 90° .
Name and sketch another mechanism which also achieves this change. (5 marks)
- (iii) Using the information given in the sketch, calculate the length of time for which the motor must run to move the bolt a distance of 30 mm. (5 marks)
- (iv) The door can be locked and unlocked, using a circuit constructed from the following components: a battery, a DPDT switch and a motor.
Indicate how these components should be connected to allow the door to lock and unlock. (5 marks)
- (v) Explain why limit switches should be used as part of the controlling circuit. (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) Many ‘end of life’ microelectronic devices (e-waste) find their way to landfill.



- (i) Outline **two** reasons why many electronic devices have a ‘short working life’.
- (ii) Outline **two** reasons why sending these products to landfill is not good practice environmentally.

(20 marks)

- (b) ‘Internet users continue to spend more time on social media sites than any other type of site.’



- (i) Explain what is meant by ‘social media’.
- (ii) Outline **one** advantage of using these sites.
- (iii) Outline **one** disadvantage of using these sites.

(20 marks)

- (c) Services to customers of Intercity rail travel have improved through technological advances.

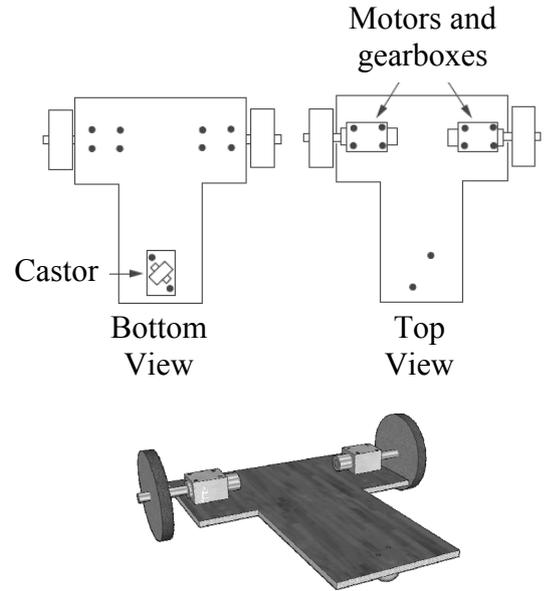
Outline, using **two** examples, new technologies now available to rail customers.



(10 marks)

4. Control Systems & Technology and Society

The graphics show a base platform for an educational robot.



- (a) (i) Outline **two** reasons why the castor is required.
- (ii) Explain why gear boxes are attached to the drive motors.
- (iii) Outline **two** reasons why some robots use tracks instead of wheels.
- (iv) Explain how, using the two motors, the robot can move forward in a straight line and then turn left.
- (v) Outline how such a robot could detect and avoid an obstacle (e.g. a wall).

(40 marks)

- (b) Robotic devices are commonly used in military operations and in space exploration.

In **each** case, explain the advantages of using robotic devices for these operations.

(10 marks)

5. Design and Manufacture

It is required to manufacture a lightweight show-jumping fence. The fence should be both free standing and height adjustable.



- (a) (i) Explain, giving **two** reasons, your choice of material to manufacture the fence.
- (ii) Outline **two** safety features which should be included in the design of the fence.
- (iii) Describe, with the aid of sketches, a proposed structure for the side supports of the show-jumping fence.
- (iv) Describe, with the aid of sketches, the features of your design which will allow the horizontal fence rails to fall if struck by a horse.

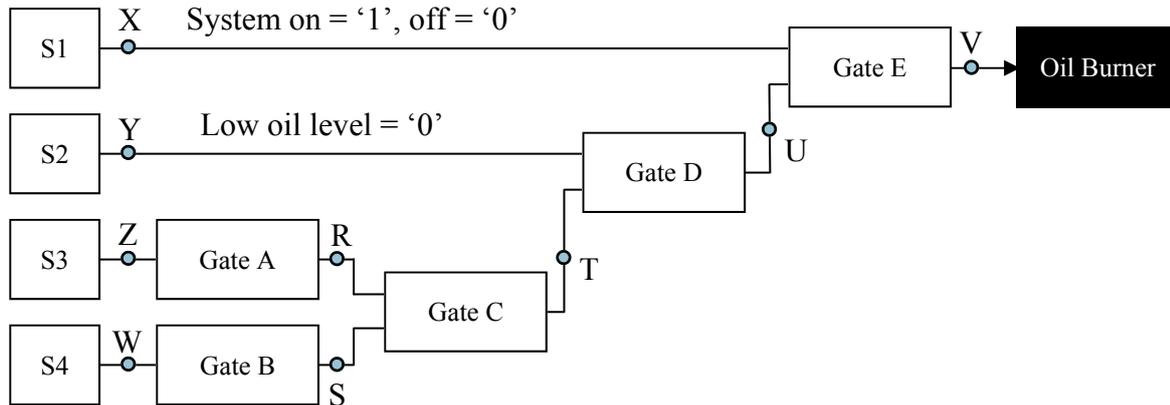
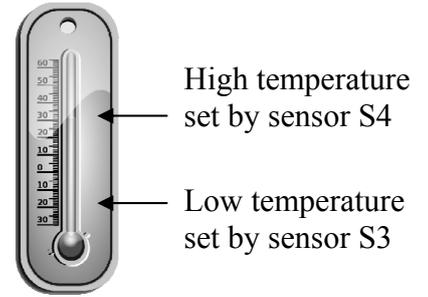
(40 marks)

- (b) Outline, with the aid of labelled sketches, a suitable mechanism to allow one person easily adjust the height of the fence.

(10 marks)

6. Control Systems

A system diagram for an oil-burning heating control unit is shown. The system contains:
 a system on/off switch (S1), a low oil-level sensor (S2),
 a low-temperature sensor (S3) and a high-temperature sensor (S4).
 S3 will output a '0' at a set low temperature and S4 will output a '1' at a set high temperature. The oil burner must operate if the temperature is between the values set by S3 and S4.
 A number of logic gates are identified as: A, B, C, D and E.



- (i) Name the logic gates required at A, C, D and E. (10 marks)
- (ii) Draw truth tables for gates C and E. (10 marks)
- (iii) Copy the truth table below into your answerbook.

For **each** of the situations described below, use the truth table to identify the logic states (1 / 0) at the points marked X, Y, Z, W, R, S, T, U and V.

	X	Y	Z	W	R	S	T	U	V
Situation 1									
Situation 2									

Situation 1: The system is turned on, there is sufficient oil in the tank, a low temperature is detected by S3 and a low temperature is detected by S4.

(10 marks)

Situation 2: The system is turned on, there is no oil in the tank, a high temperature is detected by S3 and a low temperature is detected by S4.

(10 marks)

- (iv) A latched alarm is required to indicate that there is no oil in the tank. Explain how a latch alarm can be constructed from an 'OR' logic gate. (10 marks)