



*Junior Certificate Examination, 2011*

# *Technology*

## *Higher Level*

*Wednesday, 22 June*  
*Afternoon, 2:00 - 4:00*

### *Section B and Section C*

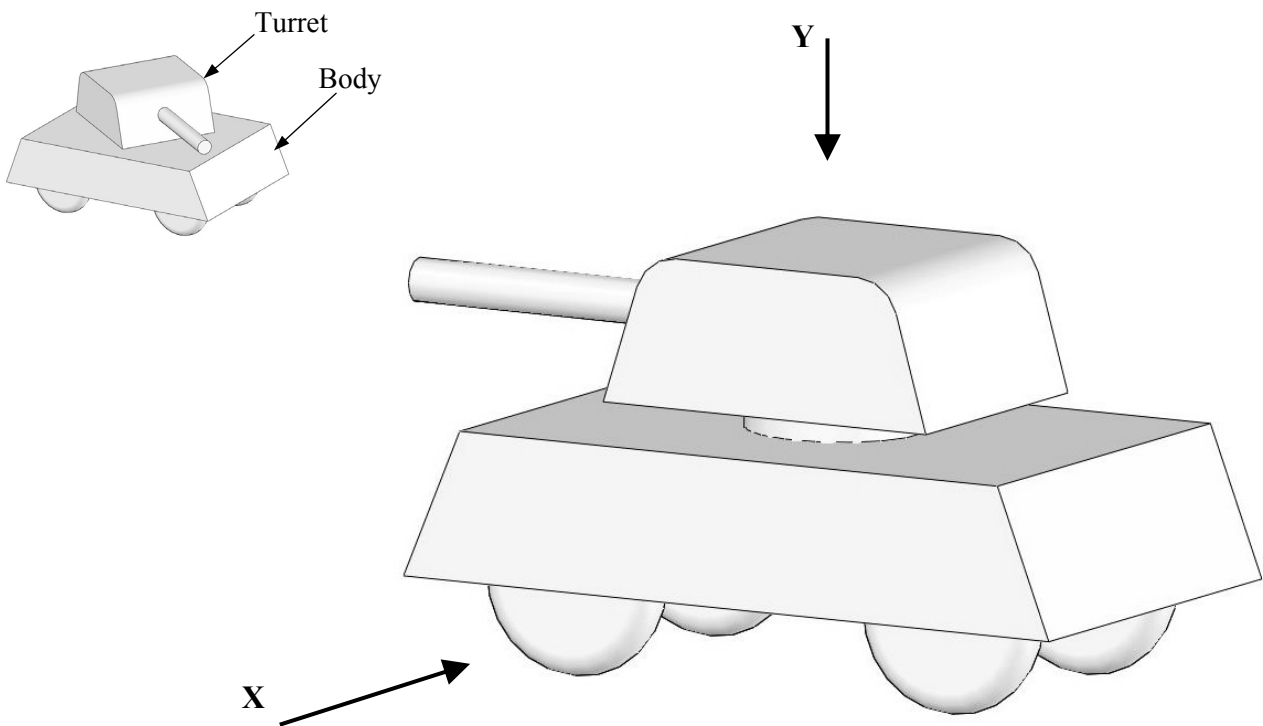
*Section B - 50 marks*

*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 graphics show a design for a model tank.



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

1. An elevation in the direction of arrow **X**.
2. A plan in the direction of arrow **Y**.

10 marks

- (ii)
1. Describe, using suitable sketches, the steps required to make the acrylic lower section (body) of the model.
  2. Describe, using suitable sketches, a method to attach the wheels to the body.

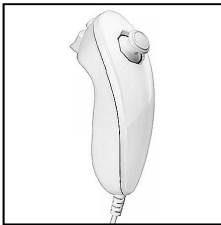
10 marks

- (iii) Sketch and name a suitable mechanism which will allow the turret to rotate through  $360^\circ$ .

5 marks

- OR -

- 1 (b) The graphics show a design of a holder for two video game controllers. The design is to be made from one piece of acrylic.

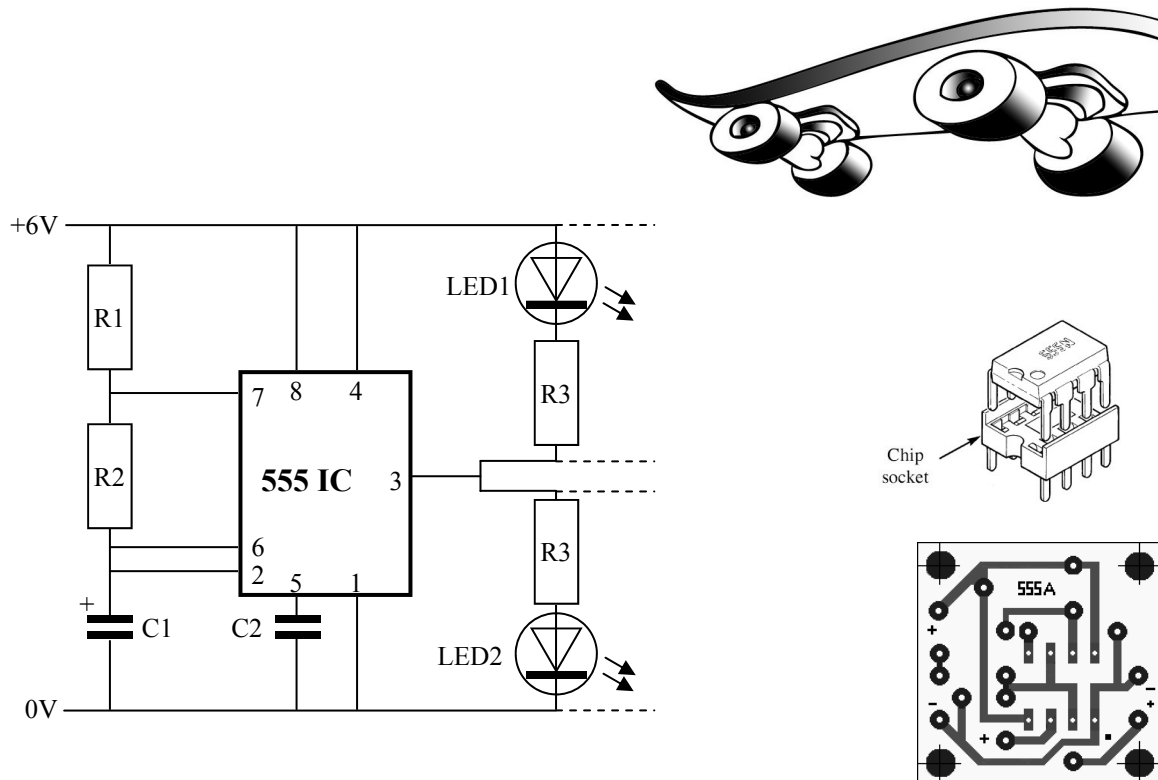


Nunchuck  
Controller



- (i) Make a well-proportioned sketch of the **development** of the holder. Indicate clearly on your sketch the position of all bend lines. 10 marks
- (ii)
  1. Explain, using sketches, how the slots on the holder could be cut out.
  2. The holder design is to be modified to hold the Nunchuck controller shown. Describe using sketches how this could be achieved. 10 marks
- (iii) When testing the completed holder, the back panel was found to break easily. Using sketches, suggest a suitable method to prevent this from occurring. 5 marks

- 2 (a) The sketch shows an electronic circuit for a flashing LED circuit to be mounted on the underside of a skateboard. (LED1 will flash, then LED 2 will flash, then the sequence will repeat).

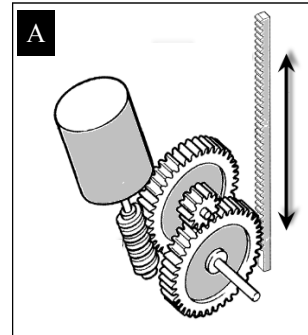


- (i) Using a sketch, explain how the pins 1 and 5 can be identified on the 555 IC.
- (ii) The circuit requires an on/off switch. Indicate clearly where this switch should be placed in the circuit.
- (iii) State **two** advantages to placing this circuit on a PCB instead of using copper stripboard.
- (iv) State **two** reasons why a chip socket should be used when mounting the 555 IC on a circuit board.
- (v) Blue LEDs will be used in this circuit (Blue LED:  $V_f = 3V$ ,  $I_{max} = 20mA$ ). Explain why protective resistors, R3, are required for the LEDs.
- (vi) Additional LEDs and resistors can be attached to the circuit in parallel with LED1 and LED2. Explain why these extra LEDs should be connected 'in parallel' and not 'in series'.

(25 marks)

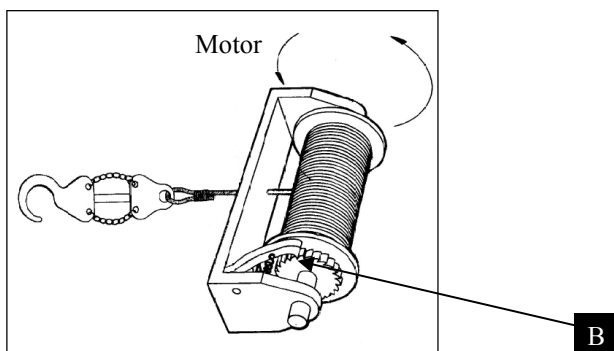
- OR -

- 2 (b) A student intends to build a model tipper-truck based on the graphic shown.  
The combined mechanism, shown at **A**, will be used to raise and lower the tipper.



- (i) Name the **two** mechanisms attached to the motor at **A**.
- (ii) State **two** benefits of using this lifting mechanism to raise and lower the tipper.
- (iii) *Hydraulic systems* are used to raise and lower the tipper on commercial trucks. Explain the term 'hydraulic'.
- (iv) The pulling system shown below will be attached to the front of the truck. Name the mechanism at **B** and explain the function of this mechanism.
- (v) If the motor attached to the pulling system turns at 300 RPM, calculate the approximate distance moved by the hook in 1 minute. (Cable Drum  $\text{\O}10$  mm).

(25 marks)



Pulling System

## 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.**

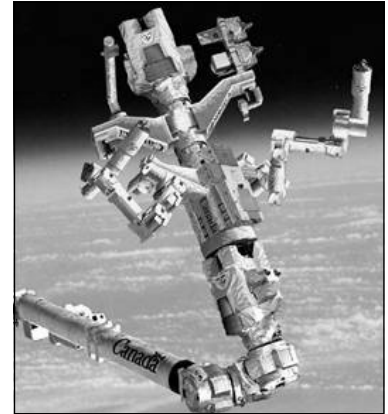
### 3. Technology and Society



- (a) Green technologies are very important in everyday life.
- (i) Explain, using **two** examples, why technologies should be “green”.
  - (ii) Explain, using **two** examples, where green technologies are used in modern homes.
  - (iii) Explain, using **two** examples, where green technologies are used in industry. (25 marks)
- (b) Outline **two** changes which technology has brought to **each** of the named activities in recent years:
- (i) intercity transport,
  - (ii) food production,
  - (iii) home-entertainment systems. (15 marks)
- (c) Explain, using **two** suitable examples, the positive impact which the Internet has on society. (10 marks)

#### 4. Control Systems & Technology and Society

Robotic devices are commonly used in the manufacturing industry and in space exploration.



- (i) Explain, giving **two** reasons, why robotic devices are preferred in these situations.
- (ii) In relation to robotic arms, explain what is meant by 'degrees of freedom'.
- (iii) Explain how robotic devices are 'instructed' to perform a task.
- (iv) Explain why **sensors** are important in guiding robotic devices used for manufacturing.
- (vi) Explain, giving **two** reasons, why robotic manufacturing is more likely to be used in first world countries.
- (vii) Outline **two** other areas where robotic devices are commonly used. In each case state **one** reason for the selection of a robot in the stated area.

(50 marks)

#### 5. Design and Manufacture

A student is required to manufacture a working model of a motorised car-park barrier as shown in the diagram. The barrier will be opened by a security keycard.



- (a)
  - (i) Describe, with the aid of sketches, the steps required to manufacture the barrier from acrylic. Name the tools and processes used.
  - (ii) Describe, with the aid of sketches, **two** suitable mechanisms to raise and lower the barrier. Name the mechanisms used.
  - (iii) Explain why a DPDT relay and limit switches are recommended in the design.

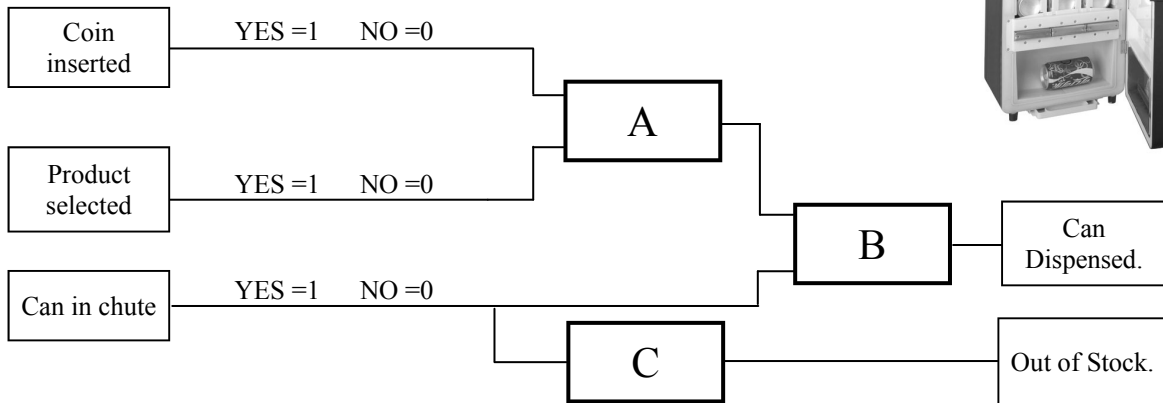
(30 marks)

- (b)
  - (i) Explain briefly how a keycard system allows the barrier to open.
  - (ii) Explain **one** security limitation of this system.
  - (iii) Outline **one** other modern security system used to overcome the stated limitation.

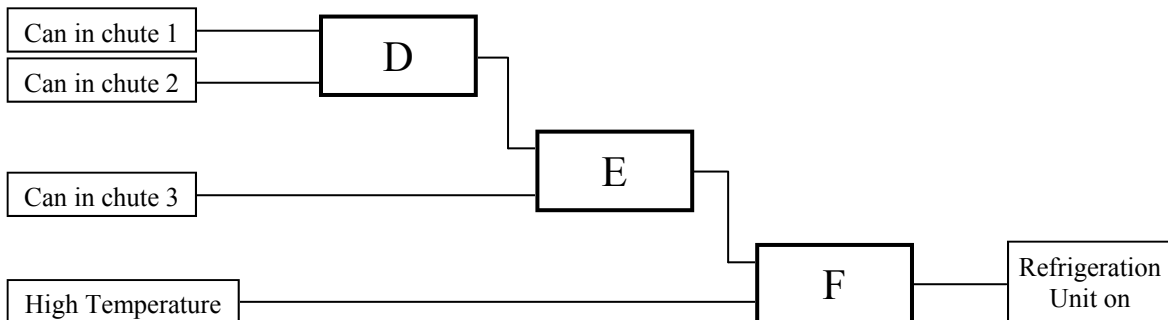
(20 marks)

## 6. Control Systems

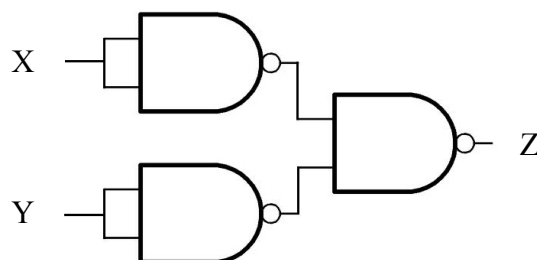
The system shown is used in a soft-drinks dispensing machine. A soft drink is dispensed if the correct coin is inserted, the type of soft drink is selected and the drink chute contains a can.



- (a) (i) Identify the logic gates required at **A**, **B** and **C**.
- (ii) Sketch and complete the truth tables for logic gates **A** and **C**.
- (b) An additional system is required which will activate a refrigeration unit if any one of the chutes contains a can and a high temperature is detected.



- (i) Name the component which will detect a high temperature.
- (ii) Identify the gates required at **D**, **E** and **F**.
- (iii) Sketch a modification to this system which will turn on an 'Out of Order' light if all three chutes are empty.
- (c) NAND logic gates can be combined to generate other logic gates. Use a truth table to determine the type of logic gate produced by the combination shown below.



(50 marks)