



*Junior Certificate Examination, 2010*

# *Technology*

## *Higher Level*

*Wednesday, 23 June*  
*Afternoon, 2:00 - 4:00*

### *Section B and Section C*

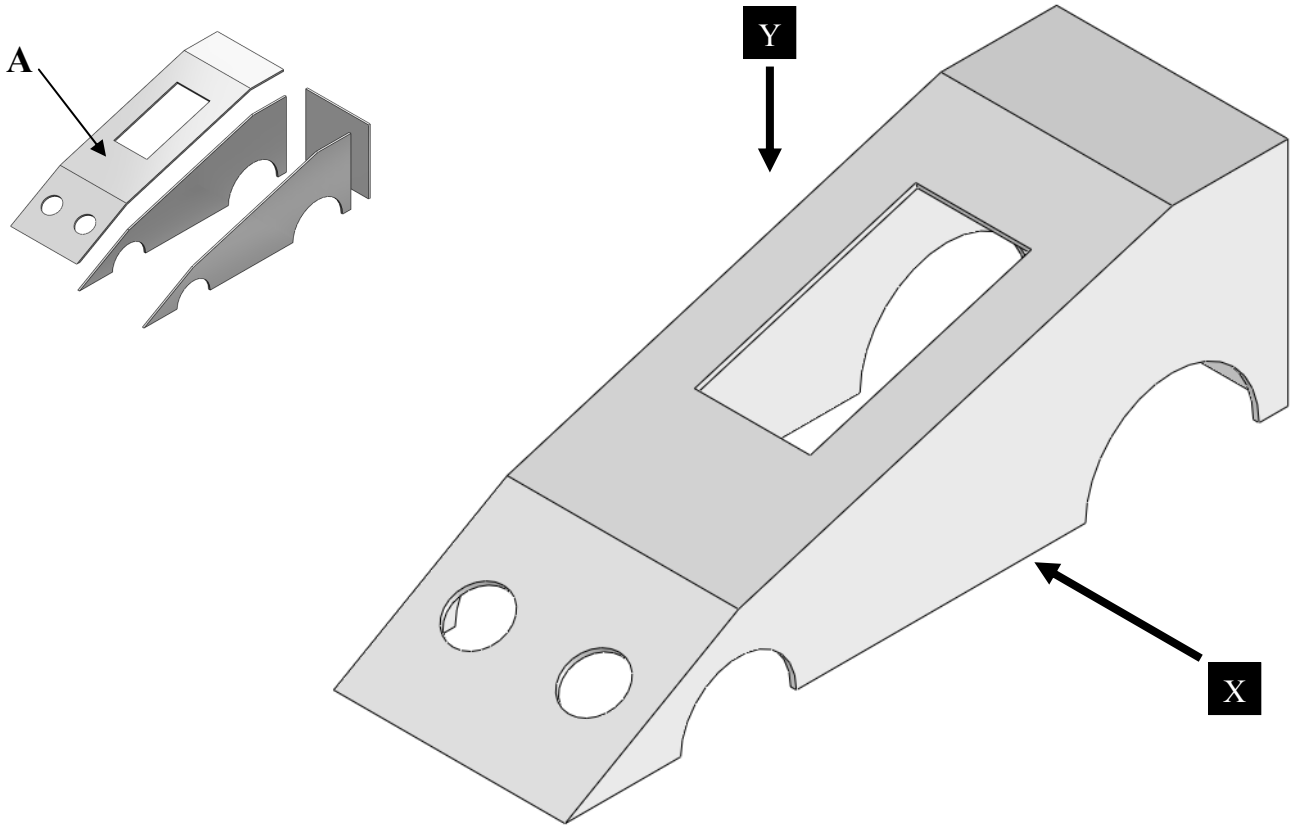
*Section B - 50 marks*

*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.

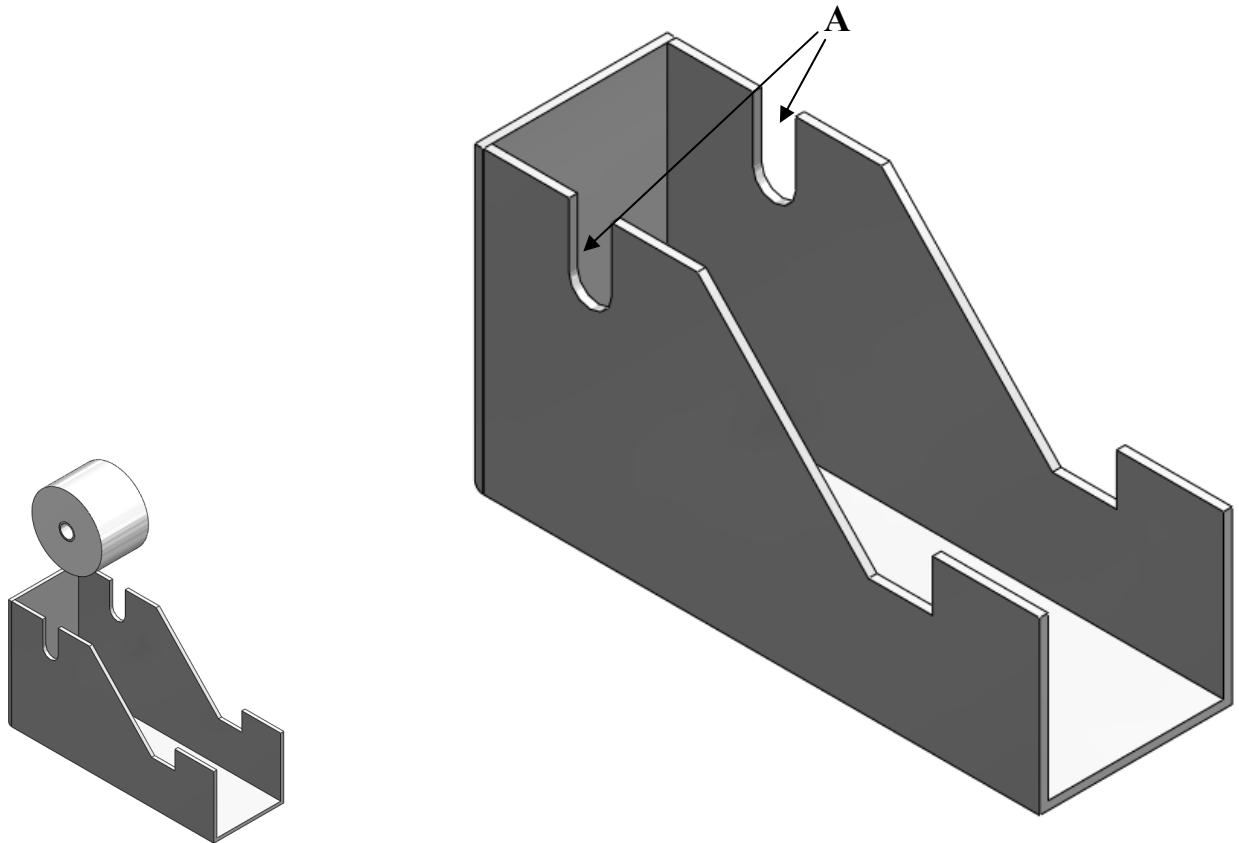
- 1.(a) The graphics show a design for a model car body.  
 The top section **A** is to be made from **one piece** of red acrylic.  
 The sides and back are separate pieces of acrylic.



- (i) Make well proportioned sketches of the following views of the assembled body:
1. An elevation when looking in the direction of arrow 'X'.
  2. A plan view when looking in the direction of arrow 'Y'.
- 10 marks
- (ii) 1. Describe using suitable sketches the steps required to make the acrylic top section **A**.
2. The body is to be attached to a chassis (base).  
 Describe using suitable sketches a method to attach the body to the chassis.
- 10 marks
- (iii) Suggest using suitable sketches **two** safety improvements which could be made to the model car.
- 5 marks

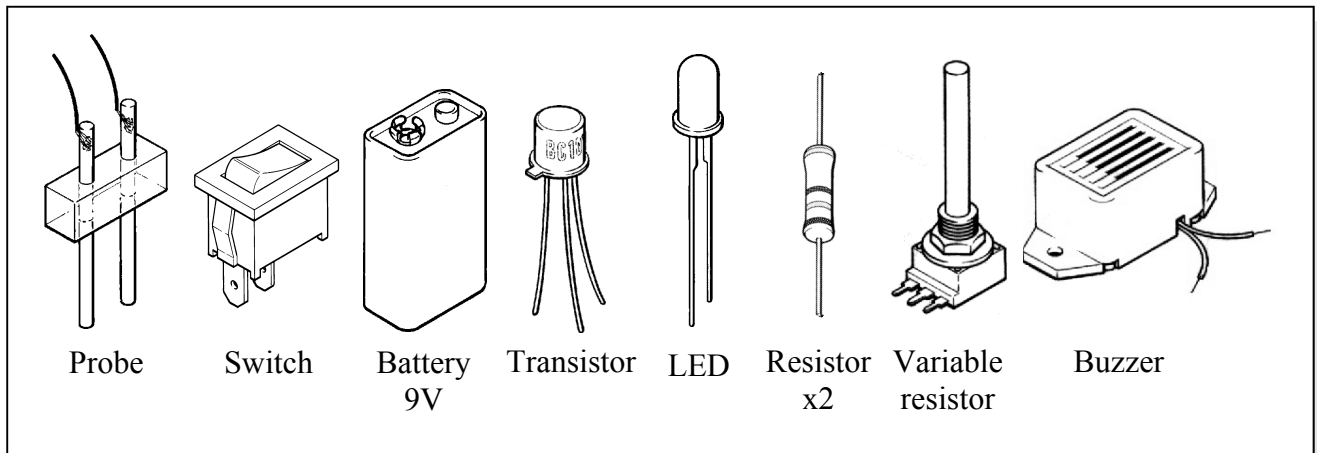
- OR -

- 1.(b) The graphics below show a student's design for a tape dispenser. The dispenser is to be made from **one piece** of acrylic.



- (i) Make a well proportioned sketch of the **development** of the tape dispenser. Indicate clearly on your sketch the position of all bend lines. 10 marks
- (ii) 1. Explain, using sketches, how the slots (A) on the side of the dispenser could be cut out.  
2. The dispenser requires an attachment to cut the tape. Describe, using sketches, how this could be achieved. 10 marks
- (iii) Suggest a suitable method to hold a roll of tape securely in the dispenser. Use sketches to support your answer. 5 marks

- 2.(a) The following components are available to manufacture a water sensor as part of a flood warning system.



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

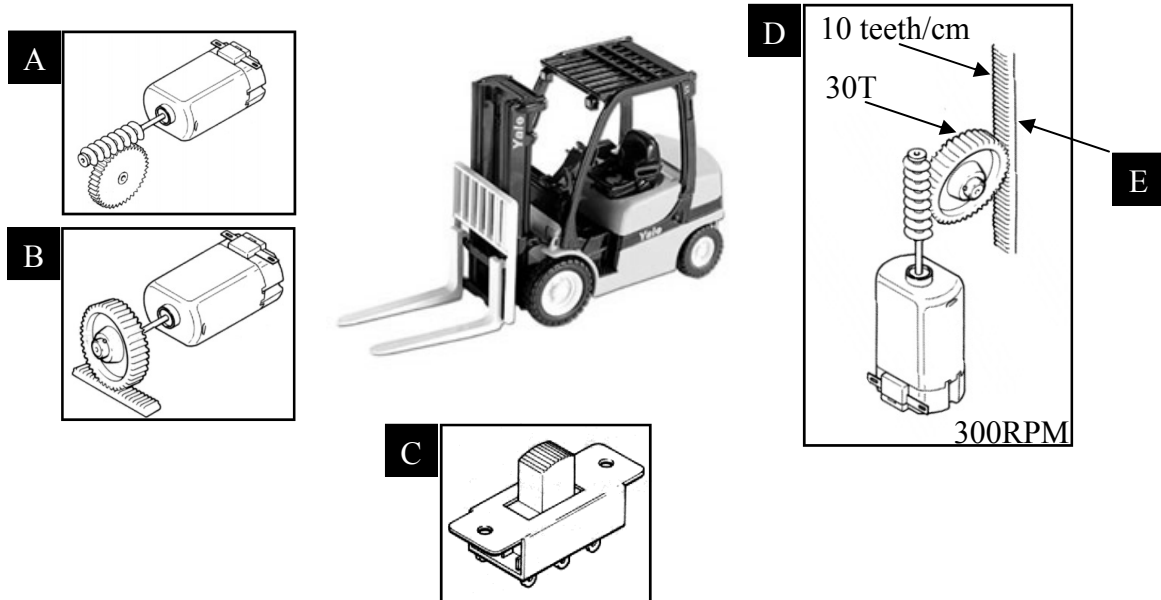
*Resistor Colour Table*

- (i)
1. State **two** functions of a transistor in a circuit.
  2. Explain how the **base pin** of the transistor can be identified.
  3. Explain why there are three pins on the variable resistor shown.
  4. A  $330\Omega$  resistor and a  $2.2\text{k}\Omega$  resistor are required in this circuit. Using the colour table shown, state the colour codes of these resistors.
  5. State **two** advantages of building this circuit using a printed circuit board (PCB) instead of using copper stripboard.
- (ii) Using the components above, sketch a circuit diagram to include:
1. An on /off switch with LED power on indicator.
  2. A sensor circuit which will activate the buzzer when rising water levels are detected.

25 marks

- OR -

- 2.(b) A student is required to build a model forklift based on the image shown. The mechanisms at **A** and **B**, are available for use in the model.



- (i) 1. Name the mechanism attached to the motor at **A**.
2. Name the mechanism attached to the motor at **B**.
3. State **two** advantages of mechanism **A** over mechanism **B** in lifting a load.
4. Name the switch shown at **C**, which is required to turn the motor in both clockwise and anticlockwise directions.

10 marks

- (ii) A combination of the two mechanisms at **D**, was decided upon for the lifting mechanism.

1. If the motor speed is 300RPM, calculate the distance moved by part **E** in 1.5 minutes.
2. Explain why limit switches should be included in the design of the lifting mechanism.

10 marks

- (iii) Sketch and name an alternative mechanism which could be used to lift the forks up and down.

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

Transportation is the largest single user of fossil fuels and a significant source of environmental pollution in developed countries.



Modern hybrid cars are designed to use alternative energies and to be eco-friendly.

- (a) (i) Describe **one** way in which modern hybrid cars have reduced their dependence on fossil fuels.
- (ii) Describe **two** ways in which modern cars can be eco-friendly.
- (iii) Describe **two** ways in which modern technologies have improved public transport.

20 marks

Food production, processing and long term storage have all been changed by new technologies.

- (b) (i) Using **one** named example in **each** case, outline how new technologies have changed food *production*, *processing* and *storage*.
- (ii) Explain briefly why a demand exists for '**organic**' food products.

20 marks

- (c) In the case of **two** named domestic appliances, outline **one** safety feature present in **each** appliance. Explain the purpose and operation of the safety feature.

10 marks

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

Modern commercial robotic machines could be classed as:  
Domestic, Industrial, Research or Military.

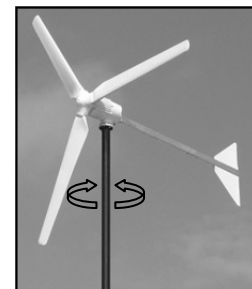


- (a) In the case of **any two** robotic machines:
  - (i) Outline the function and operation of **each** robotic machine.
  - (ii) Explain why **each** selected robot is a suitable replacement for a person.
- (b) Outline **two** ways in which the operation of a robot might be controlled or altered.
- (c) Explain why external sensors are required by robots and outline the importance of 'feedback' in controlling the operation of a robot.
- (d) Explain, using suitable sketches, how robotic machines can move over uneven ground.
- (e) Outline **two** power sources which can be used to provide movement for robotic arms.

50 marks

#### 5. Design and Manufacture

A student is required to manufacture a model of a wind speed and wind direction indicator based on the design shown.  
The completed model will be placed outdoors and must turn freely about a supporting pole.  
(Do not include the propeller in your answer)



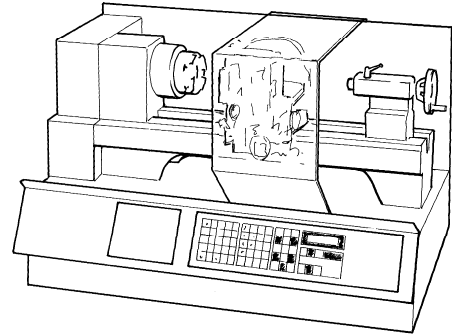
- (a) (i) Name a suitable material for the model and give **two** reasons for your choice.
  - (ii) Describe, with the aid of suitable sketches, the main steps required to manufacture the model from the named material.  
Name **three** processes required to manufacture the model.
  - (iii) Describe, with the aid of suitable sketches, how the model will turn freely about a supporting pole.
  - (iv) Describe, with the aid of suitable sketches, how the model and supporting pole will be supported to remain upright in strong winds.
- 30 marks
- (b) (i) Sketch a suitable 9V circuit diagram, to be included in the model, which will display the wind direction by lighting LEDs on a remote display.
  - (ii) Identify any limitations in the circuit design sketched and suggest a possible improvement.

20 marks

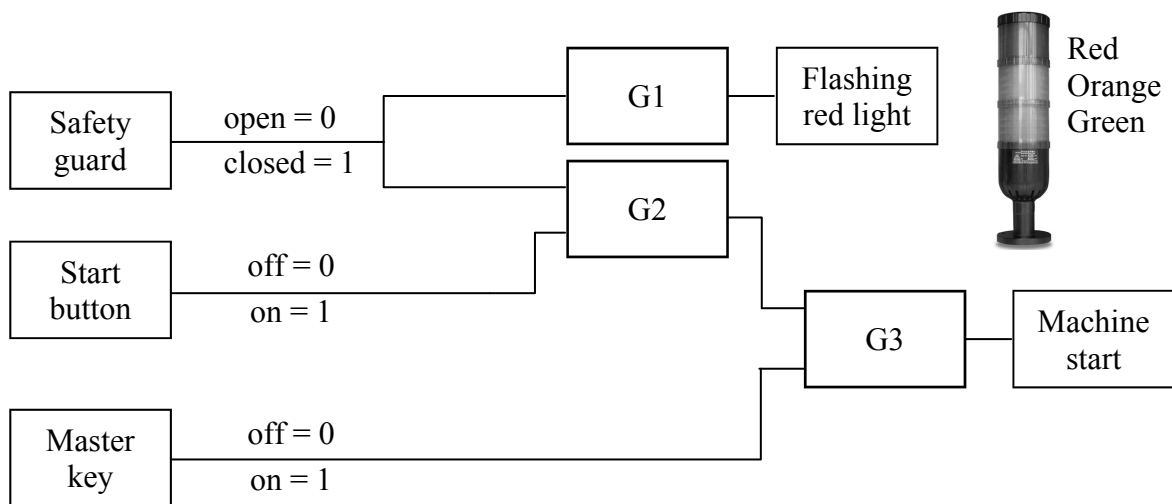
## 6. Control Systems

To improve the safety of the machine shown a control system, using logic gates, is required to prevent the operator starting the machine without the safety guard in place.

A master key must also be in place and turned on before the machine will start. A flashing light operates whenever the safety guard is open.



A block diagram of a possible system is shown.

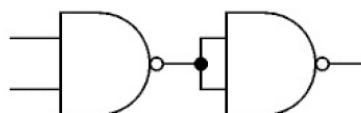


- (a) (i) Identify the logic gates required at G1, G2 and G3.
- (ii) Sketch and complete a truth table for logic gates G1 and G3.
- (iii) Indicate clearly how you would modify the system shown to display a green light, only when the machine is operating correctly i.e. the master key is turned on, the safety guard is in place and the start button is pushed.
- (iv) Indicate clearly how you would further modify the system shown to display an orange flashing light if any one of the conditions in (iii) is not set correctly.

35 marks

- (b) A NAND logic gate is a combination of two other logic gates. NAND gates can be combined to form other logic gates.

- (i) Name the two gates required to produce a NAND gate.
- (ii) Using a truth table identify the logic gate produced when two NAND gates are combined as shown.



15 marks