Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2010

Technology

Higher Level

Friday, 25 June
Afternoon, 2:00 - 4:30

Section B - Core *(48 marks)*

*Answer **both** questions.*
Each question in Section B carries 24 marks.

Section C - Options *(80 marks)*

*Answer **two** of the five options presented.*
All questions in Section C carry 40 marks.

Instructions:

(a) *Answer these questions in the answerbook provided.*

(b) *Write your examination number on the answerbook.*

(c) *Draw all sketches in pencil.*

(d) *Hand up the answerbook at the end of the examination.*

Section B - Core - *Answer Question 2* ***and*** *Question 3.*

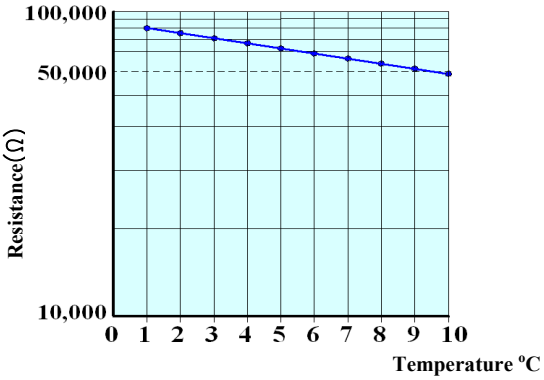
Question 2 *- Answer 2(a)* ***and*** *2(b)*

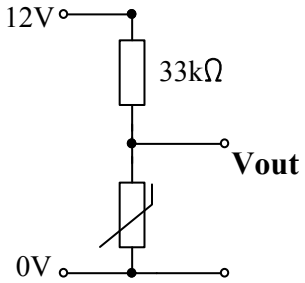
2(a) Early detection and control of fire in the home can prevent loss of life and property.

(i) Suggest **two** ways in which technology can be used to detect or control fire in the home.

(ii) In designing household products, heat and fire resistance can be important design considerations. Identify a household product which is heat or fire resistant and outline how this resistance is achieved.

2(b) Different types of thermistors are manufactured and each has its own characteristic pattern of resistance change with temperature. Part of the characteristic curve for a thermistor is shown.





(i) Identify, from the graph, the approximate resistance of the thermistor at 4°C.

(ii) Using the value from (i), calculate the **Vout** for this thermistor at 4°C.

(iii) Name a household appliance or consumer electronic product which uses a thermistor and outline the reasons for its inclusion in the product you have chosen.

Answer 2(c) ***or*** *2(d)*

2(c) In the manufacture of thermistors, it is essential that each component is 'fit for purpose'.

(i) Distinguish between the factors of: *reliability, aesthetics and conformance.*

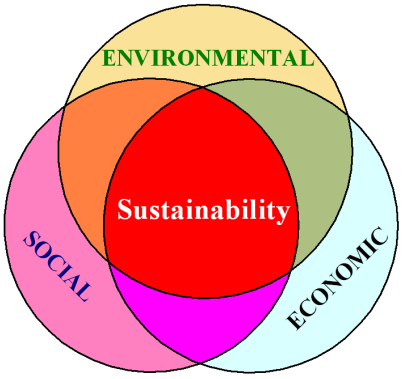
(ii) Describe **two** consequences of non-conformance for a manufacturer of thermistors.

OR

2(d) Sustainability is a key concept in controlling the amount of waste created by society.

Explain, with examples, the impact of **each** of the three overlapping 'spheres of sustainability' shown:

- Environmental sustainability
- Social sustainability
- Economic sustainability.



Question 3 - *Answer 3(a)* ***and*** *3(b)*

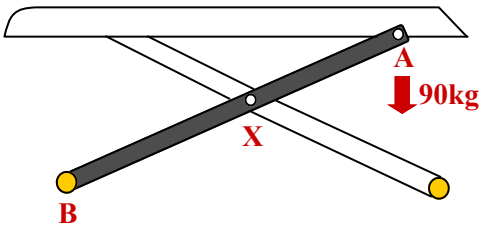
3(a) Modern cars are designed to maximise the protection of passengers in the event of an accident. Injuries can be reduced by dissipating and absorbing much of the energy of an impact while, at the same time, other devices restrain and protect the passengers.

In designing for improved car safety, describe:

- **One** way in which the energy of an impact is absorbed
- **Two** devices that restrain or protect passengers.

3(b) The graphics show a lifting platform for motorcycle maintenance.

(i) Describe in detail, using annotated sketches, a safe and reliable method of raising and lowering the platform.



(ii) If the motorcycle exerts 90kg at link **A** of the platform and the link is 1600 mm in length, calculate the force in newtons at **B** if the distance from **B** to the pivot **X** is 900 mm.

(iii) The platform is designed to have a maximum safe working height of 1200 mm.
Outline a suitable means of providing a warning to the user if the platform exceeds this height.

Answer 3(c) ***or*** *3(d)*

3(c) While on the lifting platform, it was found that the motorcycle could become unstable.

(i) Using annotated sketches, show how the design of the platform could be modified to include a suitable structure to improve the stability of the motorcycle.

(ii) Draw up a work breakdown structure (WBS) for the manufacture of this new structure.

OR

3(d) (i) Name **two** computer technologies that are used for the design or production of graphics for motorcycle helmets.

(ii) A motorcycle helmet protects the wearer by using a hard outer shell and a softer, thicker inner lining.
Outline why a single material is not used and suggest suitable materials for the shell and lining of motorcycle helmets.

Section C - Options - *Answer **any two** of the Options.*

Option 1 - Applied Control Systems *- Answer 1(a) **and** 1(b)*

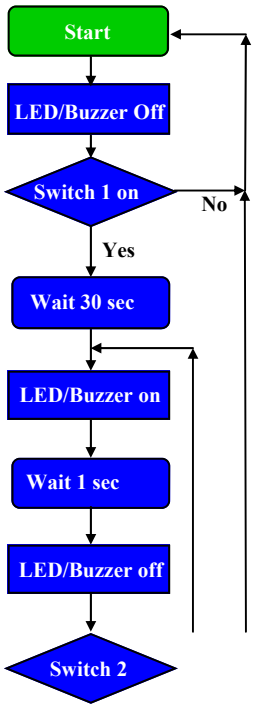
1(a) (i) It is common to see electronically controlled warning signs and traffic lights near schools.
Outline **three** electronically controlled devices that improve road safety.

(ii) As microelectronic equipment becomes more complex and prices reduce with volume, there is a tendency for products to become obsolete quickly and be replaced by newer versions.
Outline **two** environmental issues that arise from such 'built-in' obsolescence.

1(b) A time controller is required for a quiz show. Each contestant is allowed a maximum of 30 seconds to answer a mathematical question. A LED and buzzer are activated until a contestant presses switch 2 at the end of the time period.

(i) Complete the programme sequence so that the LED and buzzer continue to be activated once per second until switch 2 is pressed.

(ii) Modify the flowchart to allow the sequence to be re-set if a contestant is finished in less than the 30 second period.



*Answer 1(c) **or** 1(d)*

1(c) (i) Compare the use of servo motors with the use of stepper motors for the following aspects of robotic control:

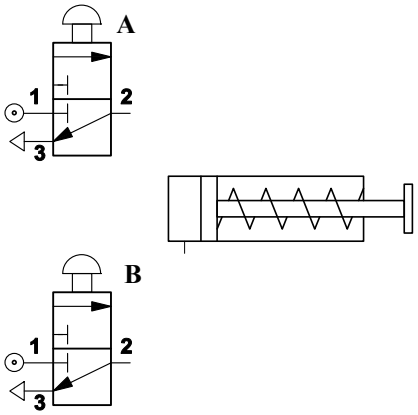
- Accurate driving of a conveyor belt
- Precision, smooth movement of a robot arm up to 45°.

(ii) Explain the term *electro-pneumatic control* and give **two** advantages of its use.

OR

1(d) (i) Discuss **two** possible reasons for the use of a pneumatic control system in preference to an electronic control system.

(ii) A pneumatically controlled energy conserving door is used at a reception office.
Draw a pneumatic circuit using the given components which allows the cylinder to open the door if either **A** *or* **B** is operated.
Include any extra components if needed.

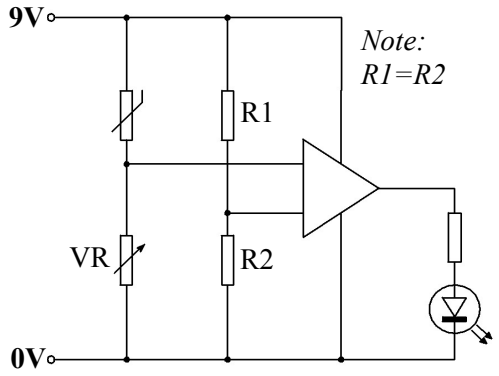


Option 2 - Electronics and Control - *Answer 2(a) **and** 2(b)*

2(a) (i) The use of rechargeable batteries in electronic equipment has increased in recent years. Outline **two** benefits of this trend.

(ii) Printed circuit boards (PCBs) are commonly used in a range of electronic equipment. Outline the main advantages of using PCBs.

2(b) The temperature sensing circuit shown uses a LED as an output.



(i) Explain, in detail, the sequence of operation of the circuit as the temperature changes.

(ii) Redraw the circuit to include a 12V fan which switches on above a set threshold temperature.

(iii) Explain **each** of the following terms:

- Astable configuration
- Monostable configuration.

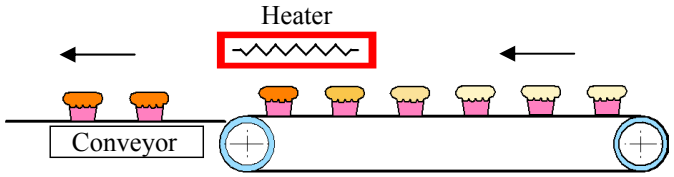
*Answer 2(c) **or** 2(d)*

2(c) (i) The circuit at ***2(b)*** above could be made more effective by including a Schmitt trigger. Outline **two** benefits of the Schmitt trigger configuration.

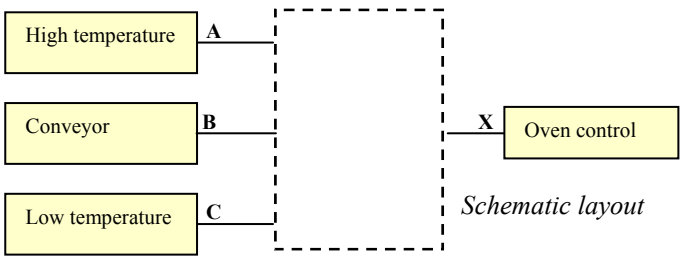
(ii) A DC motor consumes 2 watts of power and delivers 1.6 watts of power at the output shaft. Calculate the efficiency of the motor and explain why this efficiency is not 100%.

OR

2(d) Heat control is critical in an industrial oven. In the oven shown, the heating element needs to be turned off when the temperature exceeds an upper limit ***or*** when the conveyor is off and the temperature falls below a lower limit.



Graphic of oven



Schematic layout

(i) Sketch a combination of logic gates to control the oven.

(ii) Draw the truth table for output **X**.

(iii) Suggest sensor components for the inputs at **A** and **B**.

Option 3 - Information and Communications Technology - *Answer 3(a) and 3(b)*

3(a) (i) In the management of prescriptions and general patient welfare, the medical profession has recognised the increased use of ICT as a positive development.
Outline **three** ways in which ICT could be used by doctors and other medical professionals.

(ii) Many multi-national companies make extensive use of ICT to support the sharing of ideas and resources.
Give **two** advantages of using video conferencing rather than email or telephone communication.

3(b) (i) An international computer games company, HARPOON® Ltd, have installed a LAN (Local Area Network) with connections for the network server, 15 office computers and 5 wireless laptops in their new office.
Outline **three** functions of the server on the network.

(ii) HARPOON® Ltd has appointed one of its employees as a system administrator who works closely with the branch manager.
Describe **two** important tasks for which the system administrator would have responsibility.

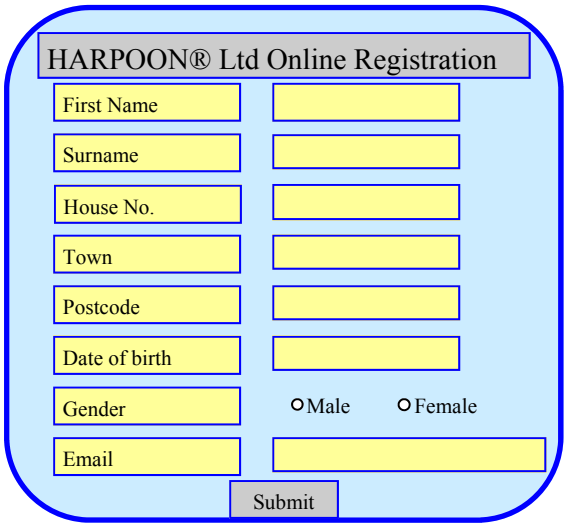
(iii) How could HARPOON® Ltd? make use of an *intranet*?

Answer 3(c) ***or*** *3(d)*

3(c) HARPOON® Ltd decided to make the first edition of a popular game available to play online. In order to access the game, the registration form shown had to be completed and submitted.

(i) Outline **two** reasons why HARPOON® Ltd collected such information from game users.

(ii) Parents complained about the nature of the information collected.
Discuss **two** issues that might have arisen.

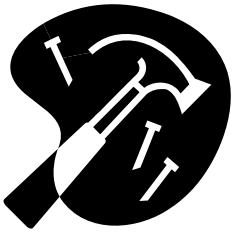


OR

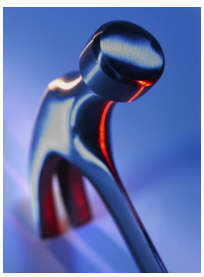
3(d) (i) Many audio devices convert analogue sound waves to a digital format. Redraw the axes shown and use them to distinguish between digital and analogue signals.

(ii) A construction company is changing its logo from image **A** to image **B**.
Discuss **two** factors that could account for the increase in file size of the image from 3KB to 128KB.

A



B



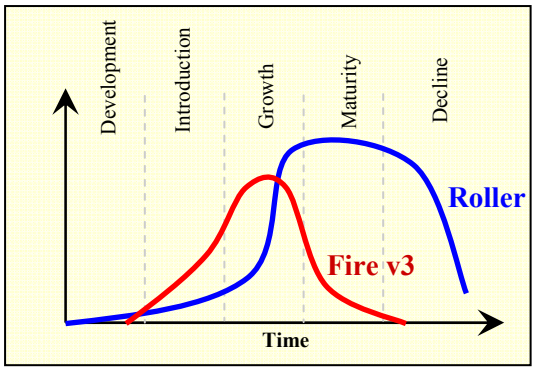
Option 4 - Manufacturing Systems - *Answer 4(a) and 4(b)*

4(a) (i) Design for Environment (DfE) is a set of guiding principles in environmentally responsible design and manufacturing.
Outline the meaning of **each** of the three main DfE considerations of:

- Manufacture
- Consumption
- Disposal.

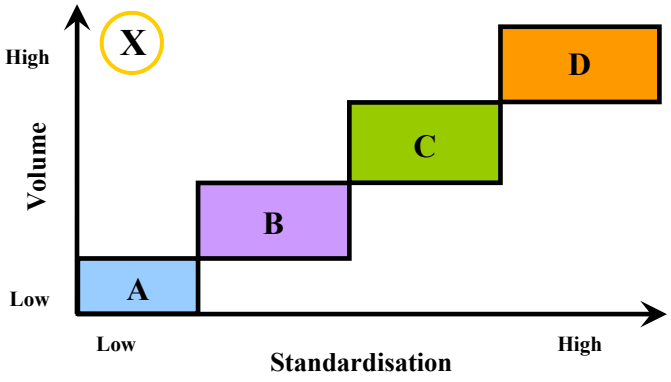
(ii) In the design of electric motors, consideration should be given to the eventual recycling of parts.
Describe **two** motor design features which facilitate recycling.

4(b) (i) The product life cycle profiles of two electronic toys, 'Fire v3' and 'Roller', are shown.
'Fire v3' is the upgraded version of the company's best selling product. 'Roller' is a totally new product.



Discuss the life cycle of **each** of these products.

(ii) The Product Process Matrix illustrates the relationship between standardisation and volume levels of product.



- Name and describe production processes corresponding to A, B, C and D
- Outline the impact for a business of a manufacturing strategy positioned at **X**.

Answer 4(c) ***or*** *4(d)*

4(c) (i) Explain the principles and advantages of Just-in-time (JIT) as an inventory strategy.

(ii) *Concurrent engineering* uses a collaborative approach to product development. Explain the following techniques associated with this approach:

- Benchmarking
- Reverse engineering.

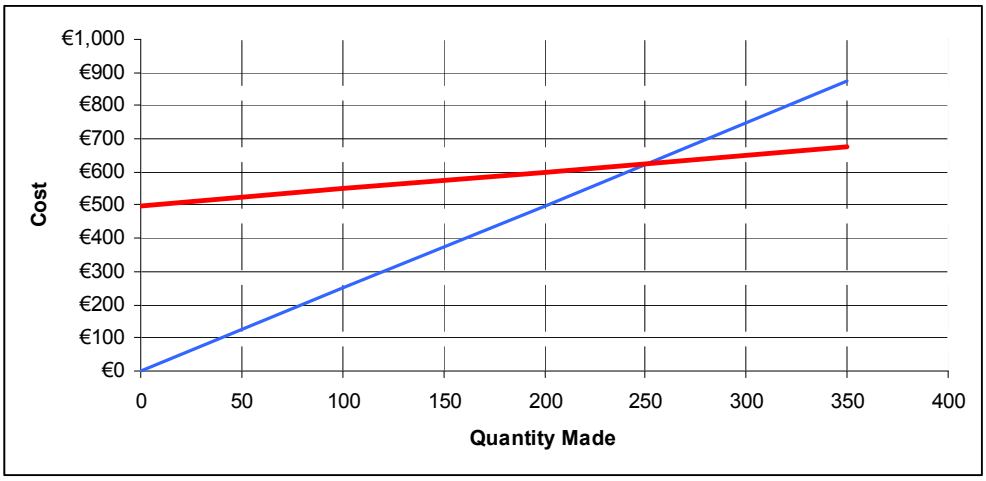
OR

4(d) (i) Key factors in competitiveness are:

- Cost
- Quality
- Flexibility
- Speed.

Use specific examples to explain **three** of these factors.

(ii) A sports equipment company is to manufacture a face guard for a new helmet. The guards can be manufactured for €2.50 each using skilled labour or production can be automated for an initial set-up cost and then €0.50 per face guard.



From the graph, determine the set-up cost for automation and the quantity of face guards required to justify the decision to automate (Break Even Quantity).

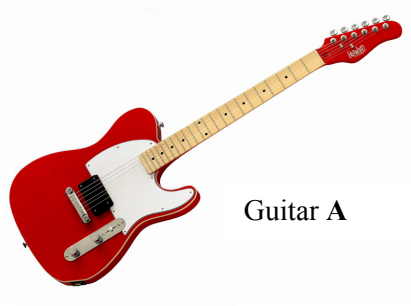
Option 5 - Materials Technology - *Answer 5(a) **and** 5(b)*

5(a) (i) In the case of **any two** of the following material categories, describe the primary properties of the material. Use specific examples to support your answer.

- Ceramic materials
- Glass-reinforced plastics
- Native hardwoods.

(ii) In classifying materials, distinguish between electrical *conductors* and electrical *insulators*.

5(b) Professional musicians often use custom-built instruments such as the guitar shown at **A**. Computerised interactive music games use instruments which are mass-produced such as the guitar shown at **B**.



Guitar **A**

Guitar **B**

(i) Select a suitable material for the body of **each** type of guitar and in **each** case justify your selection.

(ii) Describe in detail, using annotated sketches, **three** manufacturing process used to produce the customised guitar shown at **A**.

(iii) Both *composite materials* and *alloys* are often used in guitars. Distinguish between a composite material and an alloy.

*Answer 5(c) **or** 5(d)*

5(c) A special 'limited-edition' of the computer-controlled guitar, shown at **B**, is to be batch produced to coincide with a farewell tour.

(i) Explain why batch production is suitable for this limited edition of the product.

(ii) Describe, using annotated sketches, a process which could be used to manufacture this product.

OR

5(d) (i) Describe, using annotated sketches, **one** of the following material processing tools:

- Orbital sander
- Pillar drilling machine.

Highlight **two** safety features integrated into the tool you have described.

(ii) Repak Ltd is an organisation which promotes recycling of packaging. Companies are charged on the type and amount of packaging produced. The rates for 2009 are given in the table shown.

Repak FUNDING PACKAGING RECYCLING

With reference to the data given, outline **two** reasons for using cardboard instead of foamed polystyrene for packaging items such as guitar **B**.

Material	Cost (cent per kg)
Aluminium	8.4
Metal composite	11.1
Glass	0.9
Paper/cardboard	2.3
Plastic	8.9
Steel	7.9
Wood	1.1

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