



Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE 2010

MARKING SCHEME

TECHNOLOGY

ORDINARY LEVEL



Leaving Certificate Examination 2010

Technology

Ordinary Level

Marking Scheme

Section A - Core (72 marks)

Instructions:

- (a) Answer **any nine** questions in the spaces provided.
All questions in Section A carry 8 marks.

Section A. Answer **any nine** questions. All questions carry 8 marks.

1.

(i) Solder is an alloy of two metals. Which **two** metals are typically used to produce solder?

1. **Lead**
2. **Tin etc.**

(ii) List **two** safety precautions you should observe when soldering.

1. **Good Ventilation**
2. **Place iron in stand when not in use, Eye protection, Clamp work etc.**



(4 x 2 marks)

2.

Methods of communication have evolved rapidly in recent years to include social networking. Briefly describe **one** positive impact and **one** negative impact of social networking sites.



Positive Impact: **Allows family and friends to keep in contact with each other around the world, upload pictures, free method of communication etc.**

Negative Impact: **Cyber Bullying, Security issues, people less likely to meet up in person etc.**

(4+4 marks)

3.

The graphics show a D.C motor and a solar panel. Name **one** energy conversion which takes place in **each** component.

D.C Motor
Energy conversion:

Electrical to mechanical, kinetic, heat etc.

Solar Panel
Energy conversion:

Solar to electrical, heat etc.



(4+4 marks)

4.

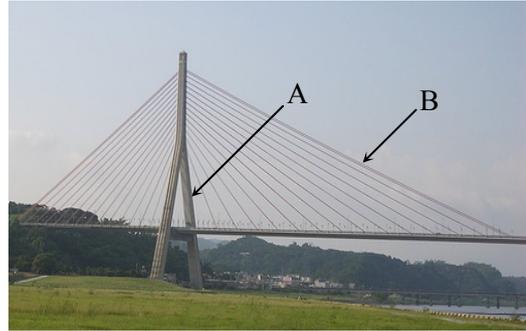
The image shows a cable stayed bridge. Identify the type of **force** acting on the elements **A** and **B** of the bridge.

A: **Compression (pushing)**

B: **Tension (pulling)**

Give **one** advantage of this type of bridge when compared to a traditional arched bridge.

Greater span achievable between supports etc.



(3+3+2 marks)

5.

What is the purpose of *Research and Investigation* in relation to project design?

To identify possible problems and solutions, provide inspiration etc.

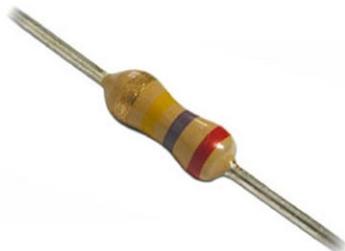
List **two** methods that can be used to facilitate Research and Investigation.

1. **Internet**
2. **Books, Magazines, Interviews etc.**

(4+2+2 marks)

6.

Outline the function of the gold band on the resistor shown.



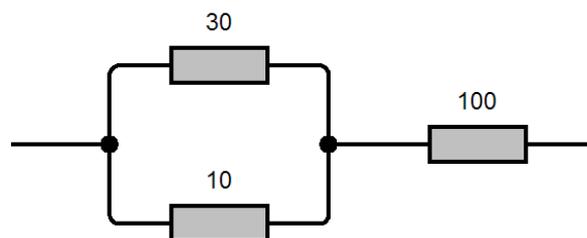
Function: **Indicates the tolerance band of the resistor (+/- 5%) etc.**

Calculate the total resistance (**R**) in the following resistor arrangement.

(**R**): **107.5 Ω**

(**7.5 + 100**)

(Formula- 2 marks)



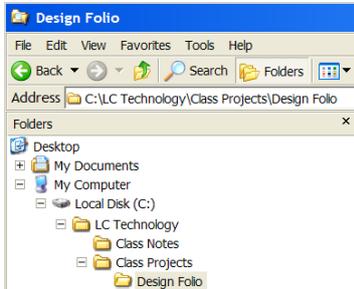
(4+4 marks)

7.

File management is very important when saving files on a computer.
Outline **two** reasons why file management is important.

Reason 1. **Know where files are saved**

Reason 2. **To prevent duplication of files in different folders, reduce space on hard drive**



Identify the root folder and **one** sub folder in a student's *Leaving Certificate Technology* folder on the C drive.

Root Folder: **LC Technology**

Sub-Folder: **Class Notes, Class Projects, Design**

(4 x 2 marks)

8.

Wavebob is an Irish developed example of how wave energy can be harnessed to contribute to the future energy needs of this country.

Outline **two** other innovative technologies that can help reduce the demand for fossil fuels.

1. **Biomass**
2. **Geothermal, Solar panels, wood pellet boilers, wind, hydro etc.**



(4+4 marks)

9.

In the box provided, make a well proportioned 3D sketch of the electrical socket shown.



Parallel lines- 2 marks
Vertical Lines- 2 marks
Proportions- 2 marks
Holes- 2 marks

10.

Technology has been used to improve sports shoes and therefore enhance the performance of athletes.

Give **two** examples of how technology has improved sports shoes.

1. **Modern materials Kevlar– stronger than leather, Foam blown polyurethane for cushioning etc.**
2. **Grip– stud/blade design etc.**



(4+4 marks)

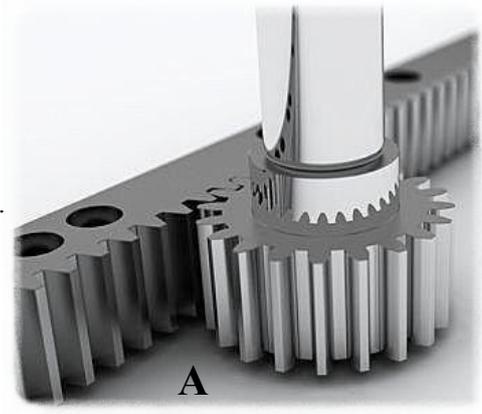
11.

Name the gear arrangement at A.

A: **Rack and Pinion**

Give **two** examples of where this mechanism could be used.

- 1: **Drilling machine column/table**
- 2: **Steering racks etc.**



(4+2+2 marks)

12.

Use **two** graphic techniques to enhance the graphic representation of games controller shown.



Appropriate shading/rendering/colouring

(4+4 marks)

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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.

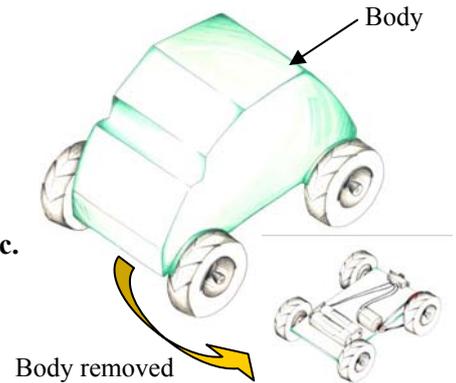
Section B - Core Answer Question 2 and Question 3.

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

(a) - 8 marks, (b) - 10 marks, (c) OR (d) - 6 marks

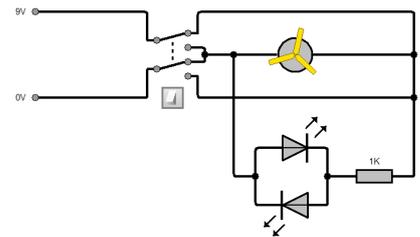
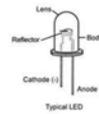
2(a) The 3D graphics show a model of a four wheel buggy.

- (i) Choose a suitable material for the manufacture of the **body** of the buggy.
Give **one** reason to justify your selection.
High Impact Polystyrene, ABS, PVC etc.
Thermoplastic, lightweight, excellent forming properties etc.
- (ii) Suggest a suitable manufacturing process for making the **body** and outline the key stages of this manufacturing process.
Vacuum Forming– manufacture mould, vacuum form the body, trim the body etc.



2(b) The buggy is to be able to move both forward and in reverse. A green LED indicates when the buggy is moving forward and a red LED indicates when the buggy is reversing.

- (i) Sketch an LED and identify on your sketch the *anode* and *cathode*.
- (ii) Draw a circuit diagram which will allow the buggy to move as outlined in **2(b)** above. Include the green and red LEDs in your circuit diagram.
- (iii) Outline using notes and annotated sketches a suitable method of joining the body of the buggy to the chassis. This method must facilitate the removal of the body when the batteries need to be changed.
Any appropriate sketch- screw fixture, snap on clip etc.



Answer 2(c) or 2(d)

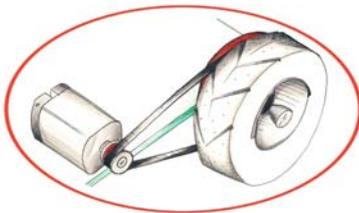
2(c)

- (i) A student has produced design sketches of a buggy. Describe how these sketches could be captured electronically and incorporated into a design portfolio.
Scan image, crop/edit image, copy and paste into design portfolio etc.
- (ii) The use of ICT can greatly enhance the presentation of the student design portfolio. Outline **two** software applications that could be used for this purpose.

Software in the following areas: Word processing, publishing, spreadsheets, Parametric CAD, Gantt charts, Electronic simulation etc.

OR

2(d)



- (i) The pulley system used to drive the buggy was found to slip frequently. Outline, using notes and an annotated sketch, a modification to the pulley system which would resolve this problem.
Any appropriate sketch– Toothed belt, Idler Gear, Motor adjustment etc.
- (ii) Suggest an alternative drive mechanism that might be used in place of the pulley system. Give **one** advantage and **one** disadvantage of your suggested mechanism.
Motor gear box– no slippage, compact, more expensive, bulky etc.

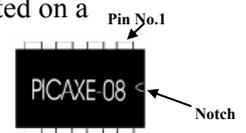
Section C - Options - Answer any two of the Options

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

1(a)

(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

- (i) Describe using a simple sketch, how *pin no.1* can be identified and located on a Peripheral Interface Controller (PIC).



- (ii) Outline briefly why PICs are used in the manufacture of interactive toys such as the toy dog shown.



Toys can be programmed to activate motors, lights, sound etc.

1(b)

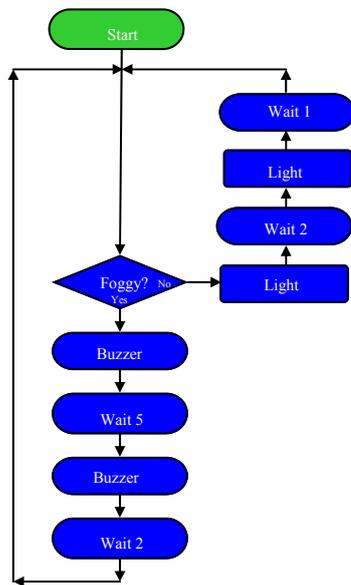
- (i) Outline what is meant by the term *Robotics*.
Using robots to perform tasks instead of humans, using programmes to control motors etc.

- (ii) Explain one of the following terms: *Humanoid Robot*; *Cartesian Robot*.

Humanoid Robots: Robots that resemble the human body form, e.g. help to do household chores etc.

Cartesian Robot: Three prismatic joints, XYZ co ordinates, pick and place, CNC Router etc.

- (iii)



For hundreds of years, lighthouses have served as beacons in the night for both navigators and those lost at sea. Countless ships and lives have been saved due to the use of warning lights and foghorns.



Draw a flowchart to control the following output devices for a model lighthouse in the following sequence.

- If conditions become foggy, sound the buzzer for 5 seconds and then switch it off for 2 seconds.
- Repeat this process continuously
- If conditions are not foggy, switch the light on for 2 seconds, and then switch it off for 1 second
- Repeat this process continuously.

Answer 1(c) or 1(d)

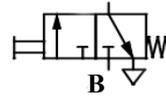
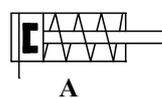
1(c)

- (i) Give **two** examples of the use of pneumatics in the food handling/production industry. Suggest **one** reason why pneumatics are suitable for **each** of the examples you have given.

Food conveyor belt, packaging etc. – hygienically clean, sound reduction, safety etc.

- (ii) The graphics at **A** and **B** show the symbols for two pneumatic components.

Name the components **A** and **B** and describe how **one** of them works.



A– Single Acting Actuator/Cylinder– air pushes piston rod in one direction only, spring return.

B- 3/2 push button control valve– pressing the button allows the flow of air to an actuator, releasing the button allows air to escape to exhaust to the atmosphere.

1(d)

OR

- (i) Suggest **two** reasons why robots might be used instead of soldiers to dispose of bombs.

Safety, reduce human error etc.

- (ii) *Work Envelope* is a term used in robotics.

Outline what is meant by the term *Work Envelope*.

The volume of space that a robot can work in is called its work envelope etc.

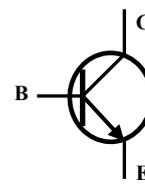


Option 2 - Electronics and Control - Answer 2(a) and 2(b)

(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

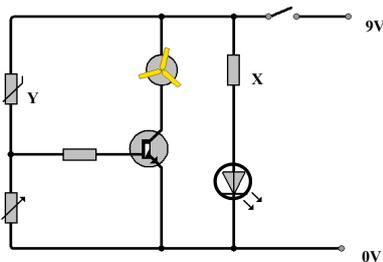
2(a)

- (i) The graphic shows a common transistor. Using a simple sketch show the pin arrangement for the *collector*, *base* and *emitter*.
- (ii) State **two** functions of transistors in circuit design.
Automatic switch, amplifier of current etc.

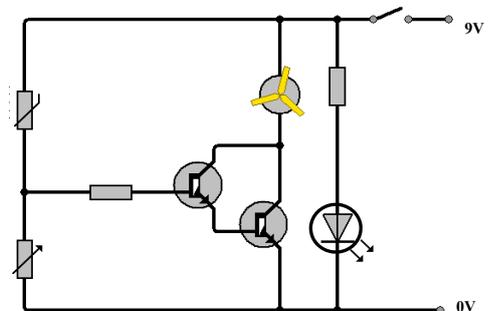


2(b)

The transistor circuit shown is used to activate a motorised fan when a high temperature is detected.



- (i) What is the function of the resistor X?
Protect the LED, reduce the flow of current etc.
- (ii) Name component Y and explain its function in the circuit.
Thermistor– its resistance changes with temperature (high when it's cold, low when it's hot) etc.
- (iii) When the circuit was built it was found that the single transistor did not supply enough current to power the motor.
Redraw the circuit replacing the single transistor with a *Darlington Pair* of transistors.



Answer 2(c) or 2(d)

2(c)

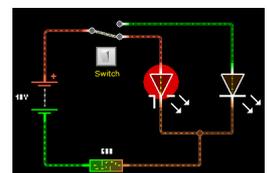
- (i) A relay is an example of a electro-mechanical switch.
Give **two** examples of where relays could be used in everyday life.
Controlling motors, spotlights in cars etc.
- (ii) Outline why a relay is used in **one** of the examples you have given in 2(c)(i) above.
Safety– control 220V motors using a switch operated at a lower voltage, e.g. 12 volts etc.



OR

2(d)

- (i) In producing circuits, students often prefer to use printed circuit boards (PCBs) rather than copper strip board. Give **two** reasons why this might be the case.
Visually easier to understand, full copper removal allows soldering to be done more effectively, pad size can be increased etc.
- (ii) When designing a circuit, outline the main advantages of using a circuit simulation software program.
Component capabilities can be explored without physically damaging them. Circuit simulation allows students to visually understand how a circuit works prior to making the circuit etc.



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

(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

3(a)



- (i) Name **two** peripheral devices that can be connected to a computer.
Mouse, keyboard, monitor, printer, scanner, data projector etc.
- (ii) List **two** functions of a computer operating system (OS).
Manages the operation of programmes and tasks, provides a user interface

3(b)

- (i) Outline **two** advantages for companies of using email, rather than the traditional postal service, when contacting customers.
Instant, free, send digital attachments instead of hard copies of attachments etc.
- (ii) Explain what any **two** parts of the email address shown represent:

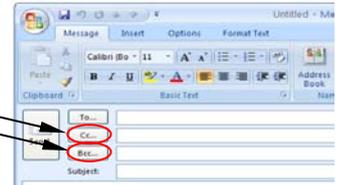


darraghm@gmail.com

Username: darraghm, separator: @, Service Provider: gmail, Domain: .com etc.

- (iii) Outline the difference between *CC* and *BCC* when sending an email to numerous recipients.

CC: Carbon Copy– the email addresses in this area will receive the message as well as the addresses in the To: box
BCC: Blind Carbon Copy- The recipients entered in this area will not be aware of the other people receiving the email message etc.



Answer 3(c) or 3(d)

3(c) The graphic shows a computer *motherboard*.



- (i) Explain the meaning of the term motherboard.
This is the main circuit board within a computer etc.
- (ii) Name **two** components found on the motherboard.
Memory sockets, power supply connectors, graphic cards, ports etc.

- (iii) Explain the function of **each** component you have named.
Memory sockets: Allows memory modules to be connected to the motherboard etc.
Power supply connectors: provide electricity to power the various parts of a computer etc.
Graphic cards: Manages images, organises pixels etc.
Ports: Allow peripheral devices to be connected to the computer etc.

OR

3(d)

- (i) When working on a computer important files and programmes should be *backed up* regularly. Explain why regular back up is an important part of file management.
Files are up to date, files that are deleted accidentally are not lost all together etc.
- (ii) Outline **two** methods which can be used to provide back up for your files.
Storage on external hard drives, CD, DVD, Server computers etc.

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

(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

4(a)

Market research is a fundamental process which should be carried out before a new product is manufactured.



- (i) Give **two** reasons for carrying out market research prior to the manufacture of a new product.
Identify gaps in a market, compare to existing products, identify potential customers etc.
- (ii) Outline **two** techniques that might be used to gather information when conducting market research.
Feasibility studies/questionnaires, interviews, analyse existing products etc.

4(b)

Once off, Batch and Mass production are manufacturing processes used in producing everyday products.



Washing Machine

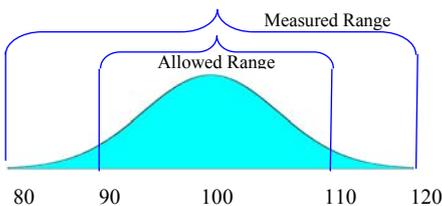


Paper Clip



Satellite

- (i) The graphics show three manufactured products. Select an appropriate manufacturing process for **each** of the items shown.
Once off: Satellite, Batch: Washing Machine, Mass: Paper Clip.
- (ii) Outline the reasons for your choice of manufacturing process in **each** case.
Once off: Satellites are not every day items, high levels of accuracy required.
Batch: Washing Machine models change and are modified regularly.
Mass: Paper Clip –just one part, large number of clips are produced worldwide etc.
- (iii) A company conducted a *process capability survey* on how well their paper clips were being packed into boxes for distribution. Each box should contain approximately 100 clips. The results were presented in the graph as shown below.



Outline briefly what the graph indicates to the company about the process of packing the containers.

The process is not capable. A lot of boxes would be over and under filled, $C_p < 1$ etc.

Answer 4(c) or 4(d)

4(c)

Just-in-time (JIT) manufacturing was developed by the Toyota car company in the 1950s.

- (i) Describe what is meant by Just-in-Time manufacturing.
Only having the required amount of stock to manufacture a product when it is needed.
Streamlined and efficient way of manufacturing in order to eliminate waste etc.
- (ii) Outline **two** benefits of JIT manufacturing to an aircraft manufacturer such as Boeing.
Only a small floor area for incoming parts would be required, less waste if designs change for parts etc.

OR

4(d)

Stage productions such as U2's 360° tour can have large operational costs as well as presenting huge logistical challenges in moving the production to new venues in foreign countries.



- (i) A *quality characteristic* of the stage production is sound quality. Describe **one quality attribute** of the sound system which would have an effect on this.
Amplification - decibel level, distortion, spec of speakers, ie frequency range Acoustics, etc.
- (ii) Working as a team is essential in ensuring that the stage is completed on time at each new venue.

Outline **two** elements of team work that you consider most important in achieving this task.

Identify team leader, delegate tasks to individuals/team, set target deadlines, assess/monitor how the team is performing etc.

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

(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

5(a)

- (i) The graphics show a gear and a bicycle frame.
Name a suitable material for the manufacture of **each** item.
Gear: Nylon etc. Bicycle Frame: Titanium/Aluminium Alloy etc.
- (ii) In **each** case, outline **two** properties of the material that make it suitable for the product.
Nylon: lightweight, hardwearing, no lubrication, noise reduction, corrosion and chemical resistant etc.
Titanium/Aluminium Alloy: lightweight, high weight to strength ratio, corrosion resistant, easy to finish, flexible etc.



Gear



Bicycle Frame

5(b)

The graphic below shows a spiral staircase.

- (i) Choose **two** materials that would be suitable for the production of the handrail for such a staircase.
Hand Rail: Hardwood (ash, beech etc.), composite material etc.
- (ii) Using annotated sketches, describe a suitable method of joining the steps to the frame.
Any suitable sketch: methods— bolted, screw fixings, welded sections etc.
- (iii) Strength and safety when in use are two key requirements of wooden steps in a staircase.

- Sketch a plan of a step indicating the direction of the wood grain which would best meet these requirements.
- Outline **one** consequence if the step is not designed and manufactured with the direction of the wood grain in mind.



Consequences: Step snap very easily etc.

Answer 5(c) or 5(d)

5(c)

- (i) *Smart Materials* have become an important category of materials for designers and manufacturers. What is meant by the term Smart Material?
A smart material can be described as a material that has a useful response to external influences or stimuli etc.
- (ii) Give **two** examples of Smart Materials and for **each** of your examples suggest an appropriate use.
Examples: Metal Springs, light bulb filament, heat shrink tubing, smart wire, smart link silicon tubing, piezo electric material, polymorph, chameleon colours etc.
Any appropriate use.



OR

5(d)

- (i) Some materials are prone to *corrosion*. Explain the term corrosion.
Corrosion is the deterioration of a material as a result of a reaction with its environment etc.
- (ii) Corrosion can be avoided by *choosing appropriate materials* or by *applying surface treatments*.
Discuss **one** example of each of the methods of corrosion prevention mentioned above.
Electroplating, paint, plastic powder coated, anodising e.g. aluminium, sacrificial protection, design related etc.



