Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE 2009

MARKING SCHEME

TECHNOLOGY

ORDINARY LEVEL

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Section A - Core *(72 marks)*

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

1.

(i) What is the function of an Operating System (OS) on a computer?

Function:

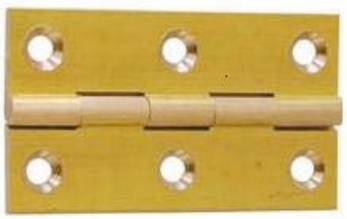
Software that manages the operation of the computer, Provides a user interface, prevent programs interfering with each other etc. *4*

(ii) Name two operating systems that are used on modern computers.

1. **Windows Vista** *2*

2. **XP, 2000, Linux, MAC OS, Solaris etc .** *2*

2.



A brass hinge used for an external door is shown .
State two reasons why brass is a suitable material for this hinge?

1: **Brass does not rust (non-ferrous)** *2*

2: **Decorative, strong, tough etc.** *2*

The holes in this hinge have been countersunk. Outline one reason for countersinking?

Head of screw finishes flush with the hinge, allows the hinge and door to close fully etc. *4*

3.

Name one energy conversion that takes place in a wind turbine.

Conversion: **Mechanical to electrical, mechanical to heat, mechanical to sound etc.** *4*

Give one example of each of the following energy sources.

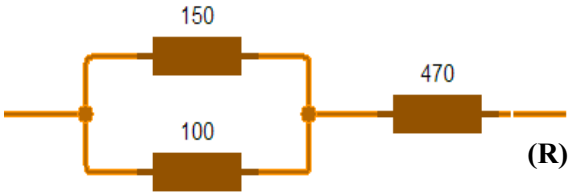
Renewable: **Hydro/ tidal, solar, wind, wood, biomass, geothermal etc.** *2*

Non-renewable: **Oil, gas, coal, peat, nuclear etc.** *2*

4. State a function of a resistor?

Function: **To resist the flow of electrical current in a circuit** *4*

Calculate the total resistance **(R)** in the following resistor combination?



60Ω – 2 marks

(R) : 530Ω *4*

$1/R1 + 1/R2 = 1/R_T$

$R_T + 470 = R$

5.

What is the purpose of *Evaluation* in relation to project manufacture?

Evaluation: **How well does the finished project satisfy the brief?etc** *4*

List two questions that might be asked about a project at this stage?

Question 1: **Does the project function as it is supposed to?** *2*

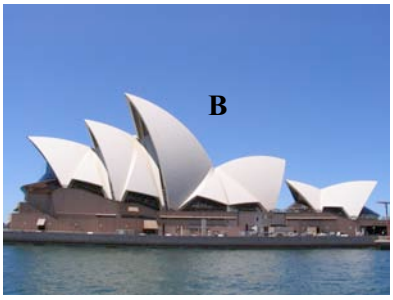
Question 2: **Is the project safe? (Or any two appropriate questions)** *2*

6. Identify the type of structure in the graphics **A** and **B**

A: **Frame structure** *2*

B: **Shell structure** *2*

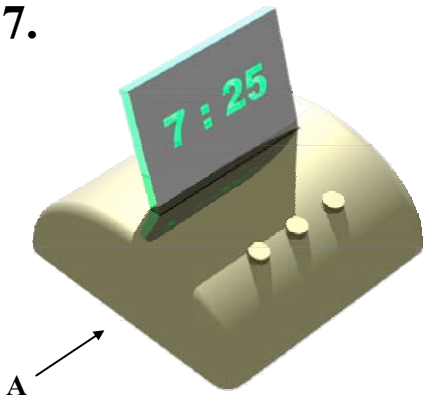
Forces act on structures in various ways. Identify the force acting on a *strut* and the force acting on a *tie.*



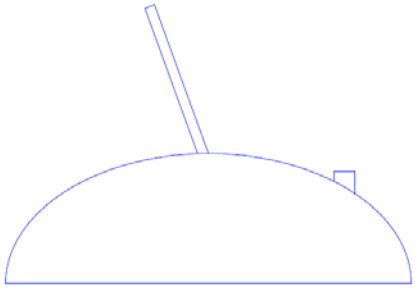
Strut: **Compression (pushing force)** *2*

Tie: **Tension (pulling/stretching force)** *2*

7.



Curve– *4*
Lines– *4*



In the box provided, make a well proportioned 2D sketch of the alarm clock when viewed parallel to the direction of arrow **A**

8. Corn starch is a new biodegradable material used in food packaging.

Explain the term biodegradable.

Breakdown material, decompose, natural, recyclable etc.

4

State two advantages of using a biodegradable material in packaging design.

1: **Contributing to reduction in waste and use of Land fill sites/ Less Plastic disposal etc.** *2*

2: **Cost factor manufacturing, Education / Sustainability / Cultural etc.** *2*

9.

Explain what the CE mark on products represents?

CE Mark:

This mark shows that a product complies with European health, safety and environmental protection legislations.

CE

8

10.

The TV remote control holder shown is to be manufactured from a single piece of acrylic.
List four main steps required to manufacture this item.

1: **Marking out** *2*

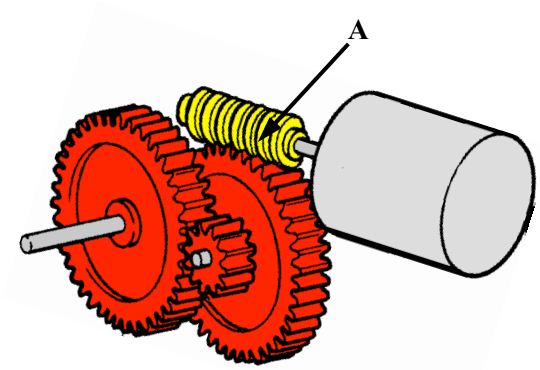
2: **Drill 2 holes** *2*

3: **Cut/file slots** *2*

4: **Bend, file and polish to finish (any relevant 4)** *2*

11.

Name the gear arrangement at **A**.



A: **Worm and worm wheel** *4*

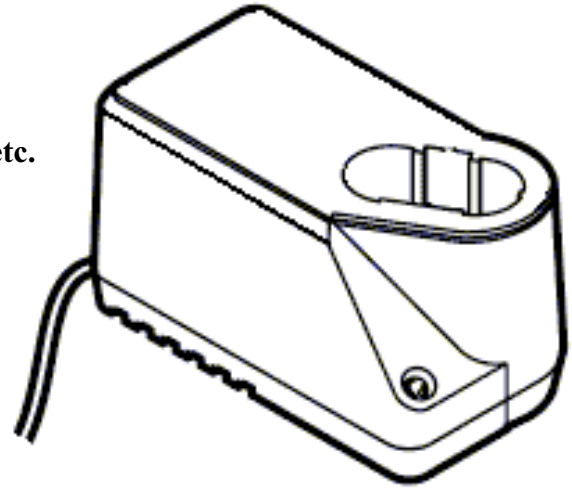
Outline two advantages of using this arrangement in project work.

1: **Speed reduction,** *2*

2: **Change in direction of shafts, no slip etc.** *2*

12. Use **two** graphic techniques to enhance the graphic representation of the battery charger shown.

Shading, rendering etc. *2 x 4*



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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.*

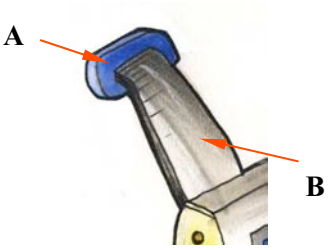
***Question 2** - Answer 2(a) **and** 2(b)* *(a) - 8 marks, (b) - 10 marks, (c) OR (d) - 6 marks*

2(a) The self-powered torch is powered by a manually operated internal generator as shown in the sketch. A compound gear train is used in conjunction with the generator.

(i) State the function of the compound gear train.
It increases the RPM of the generator producing more electrical current.

(ii) A decision was made to use 3 LEDs in the torch instead of a tungsten filament bulb. Give **two** reasons for this decision.
Energy efficient, variety of colours, long life etc.

2(b)



(i) Name a suitable manufacturing process for the body of the self-powered torch.
Vacuum forming, blow moulding, injection moulding etc.
Name a suitable plastic for the torch body.
ABS, Polypropylene, high density polyethylene etc.
Give **two** reasons for your choice of plastic.

Strength to weight ratio, resistance, toughness, durability, manufacturing properties.

(ii) Identify **two** energy conversions taking place in the torch.
Mechanical to electrical, electrical to light, electrical to heat, mechanical to heat etc.

(iii) Describe using notes and annotated sketches:
1. A suitable shape for grip **A**. **Any appropriate shape**
2. An appropriate method of attaching grip **A** to the handle **B** so as to ensure ease of use.
Bolt, engineered snap, etc.

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

2(c)

(i) Gantt charts can play a critical role in the overall management of a project.
List **two** functions of a Gantt chart.

Outlines the sequence of the various stages of a task, indicate approximate time weightings per task , indicate progress to date, help to identify areas of concern etc.

(ii) In manufacturing products such as the self-powered torch, the quality of the finished product can often be directly related to its cost.

Discuss this statement giving **two** possible benefits of purchasing a product that is more expensive.
Higher quality, longer life etc.

OR

2(d)

(i) Give **two** examples of energy efficient products or devices which have contributed to sustainable use of energy.
Solar road safety signs, wind up radios etc.

(ii) Explain how self-powered electrical devices can help reduce the demand for energy from non-renewable sources. **Don't need external power source for recharging etc.**

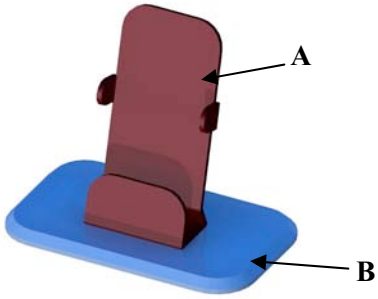
Give **two** limitations of self-powered electrical devices.

Has to be wound up, charge may run down quickly, aesthetics, sunshine is not available continuously.

Question 3 *- Answer 3(a)* ***and*** *3(b)* *(a) - 8 marks, (b) - 10 marks, (c) OR (d) - 6 marks*

3(a)

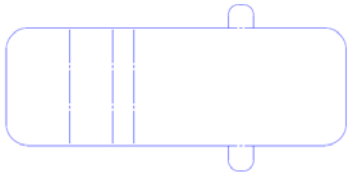
The graphic shows a design for a mobile phone holder.
Part **A** is made from a single piece of acrylic and part **B** is to be made from another suitable material.



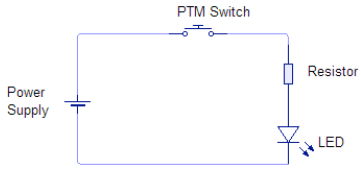
(i) Suggest a suitable material for the base **B** and give **two** reasons for your selection.
Acrylic, aluminium, red deal laminboard etc.
Reasons: Appearance, cost, properties, processing etc.

(ii) Describe, using notes and sketches, a suitable method of joining part **A** to part **B** without using adhesives.
Set screws (tapping a hole in the base), wood screws if wood based material is used
Design based feature (click into place) etc.

3(b)



(i) Draw a well proportioned freehand sketch of the development of part **A**, indicating **all** fold lines.



(ii) A light emitting diode (LED) is required to indicate that the mobile phone is resting in its holder. Draw a suitable circuit diagram to achieve this. Label all components.

(iii) Soldering is used to form the joints when connecting electrical components. State the function of **flux** when soldering and outline **two** safety precautions to be observed when using a soldering iron.
Function: **Remove oxides, ensuring effective formation of joints.**
Safety Precautions: **Use soldering stand, ventilation etc.**

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

3(c)

(i) The erection of mobile phone masts in prominent places can be a cause of concern for many people.
Discuss **one** advantage, and **one** disadvantage of the erection of such masts.
Advantage: Better coverage etc.
Disadvantage: Health concerns, aesthetics etc.

(ii) The mast shown uses *triangulation* in its construction. Describe using notes and annotated sketches the principle of triangulation.
Triangular shapes offers a high degree of rigidity– as a result, they are used in the construction of frame structures like a mast. (appropriate sketch)

OR

3(d)

(i) State **two** positive and **two** negative impacts that mobile phone technology can have on today's society.
Positive Impacts: **Better means of communication, quality of life etc**
Negative Impacts: **Quality of life, health concerns etc.**

(ii) Designers use freehand sketches to produce initial design drawings for their products.
Suggest **two** advantages of freehand sketching at the design stage.

Designs produced quickly, sketching allows for better understand of the task at hand.

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

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

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

1(a)

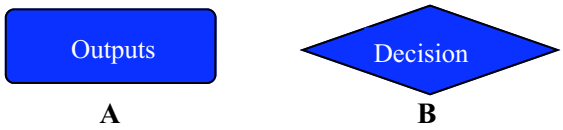
(i) A Peripheral Interface Controller (PIC) can be described as a *programmable chip*. Give **one** advantage of a *programmable chip* over an integrated circuit.
They can be reprogrammed repeatedly, unlike ICs.

(ii) Give **two** examples of where PICs are used in everyday life.
Washing Machines, Microwaves, Turnstiles at concerts or sports stadiums, 'intelligent toys' etc.

1(b)

(i) Outline **one** reason why flowcharts are used when writing a program for a PIC.
They provide a visual understanding of what a program is intended to do, help to anticipate problems etc.

(ii) Two commands used in a flowchart for a PIC controlled system are shown at **A** and **B**. Outline the function of **each** command.



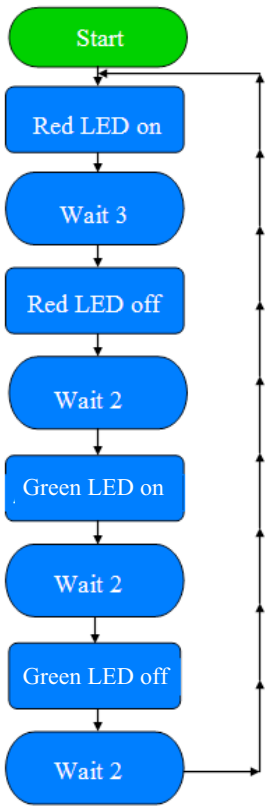
A **B**

Outputs: **These are used to switch on or off any output devices that are connected to the outputs of a PIC microcontroller (possible outputs: LED's, motors, buzzers).**

Decision: **When the flowchart reaches a decision block the program has two options. *Yes* and *No*: each option instructs the program to follow a particular path. intended to do, help to anticipate problems etc.**

(iii) Two LEDs (one red and one green) are to be used as part of a shop window display. A PIC is to be used to control the lighting sequence of the LEDs. Complete the flowchart shown below, using labelled cells, to turn the LEDs on and off in the following sequence:

Flowchart:



- Switch on the red LED for 3 seconds, and then switch it off
- Wait for 2 seconds
- Switch on the green LED for 2 seconds, and then switch it off
- Wait for 2 seconds
- Repeat this process continuously.

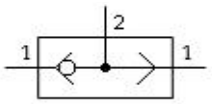
Answer 1(c) ***or*** *1(d)*

1(c)

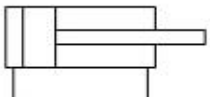
Compressed air is used in pneumatics to perform a variety of tasks.

(i) Give **two** advantages of using pneumatics in industrial situations.
Clean, will perform a task accurately again and again.

(ii) Name the pneumatic components **A** and **B** below and describe how each one works.



A



B

Component (a) is a Shuttle valve.

This is a valve that allows air to travel in one direction only at a junction. It acts as an OR gate. The spool in the valve controls the movement of air.

Component (b) is a Double Acting Cylinder.

This is a pneumatic output device that requires compressed air to make the piston move in and out. Air pressure is needed to make the piston go positive. Air pressure is needed in the opposite direction to make the piston go negative.

OR

1(d)

(i) Robotic systems have dramatically affected our everyday lives.
Outline **one positive** and **one negative** contribution robots have made in the manufacturing industry.

Positive Contribution: Mass production of parts/Safety etc.

Negative Contribution: **Manufacturing jobs lost etc.**

(ii) Explain the following terms associated with robotics:
- Degrees of freedom
- End effectors.

Degrees of Freedom:
These refer to the number of axes on a robot. The Degrees of Freedom can provide rotational or linear motion.

End Effectors:
These are fitted to the robot wrist to perform a variety of tasks – holding, lifting, welding, painting and more. There are 2 types of end effectors – Grippers and Tools.

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

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

2(a)

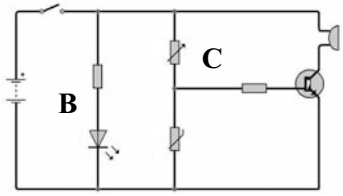
The graphics show a capacitor, and its electronic symbol.

(i) State the unit of measurement of capacitance.
Capacitance is measured in units called farads. A 1-farad capacitor can store one coulomb of charge at 1 volt.

(ii) Explain briefly how an electrolytic capacitor works.
The positive leg of the capacitor must be connected to the positive side of the power supply. This allows the capacitor to charge up until it becomes fully charged. The charge can then be released as required.

2(b)

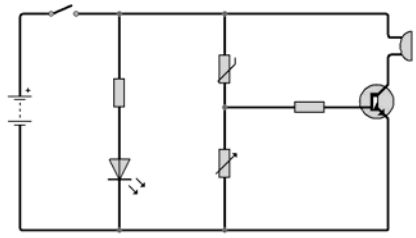
The transistor circuit shown is used to sound an alarm when low temperatures are detected.



(i) What are the functions of the resistor and the LED at **B** in the circuit.
The function of the LED is to indicate that the circuit is switched on. The function of the resistor is to limit the current flow to the LED and in doing so protect it from been destroyed.

(ii) Name component **C** and explain its function in the circuit.
Component C is a variable resistor and its function is to vary the sensitivity of the circuit.

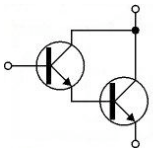
(iii) Redraw the circuit to show how high temperature could be detected.
The thermistor and the variable resistor are reversed to allow high temperature to be detected.



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

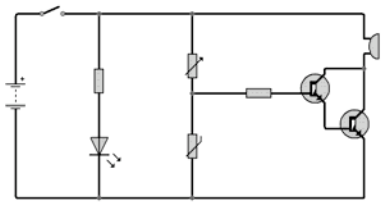
2(c)

The graphic shows two electronic components linked together in a specific arrangement.



(i) Name this arrangement.
A Darlington pair (of transistors).

(ii) State the function of this arrangement and redraw the circuit at ***2(b)*** to show how it would be incorporated.
This arrangement is much more responsive to a small change in the base current.



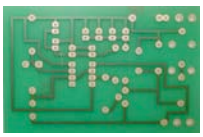
(iii) What effect would the addition of this arrangement have on the operation of the circuit at ***2(b)***.
This means that the output device will change from off to on more sharply.

OR

2(d)

(i) State **two** advantages of constructing a circuit on a printed circuit board (PCB).

The PCB artwork can be identical to the circuit drawn, thus making it easy to understand the population of components. PCB's can be designed to a specific shape and size etc.



(ii) Describe **one** method of producing a PCB in the Technology Room having due regard to current health and safety regulations.

CNC Router, etching (health and safety concerns), vinyl cutter etc.

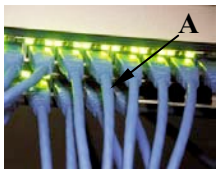
Option 3 - Information and Communications Technology - Answer 3(a) and 3(b)

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

(i) List **three** factors which would influence your choice when purchasing a home computer.
Cost, Operating System, Processor Speed, Hard Disk Space, RAM Memory, Graphics/Sound Card etc.

(ii) In terms of memory, explain the difference between ROM and RAM.
Read-Only Memory: Permanent instructions , Computer loads data from ROM , Major components are functioning properly etc.
Random Access Memory: Primary storage / store programs while processing, Distribute memory between programs, Information lost if not saved etc.

3(b) There are many factors to be considered when installing a network in a building such as a school.



(i) Name the type of connector shown at **A**. **RJ-45**

(ii) Outline **three** factors that affect the choice of cable for a particular network installation.
The distance between computers, the physical environment in which the cables must operate, the type of network being installed etc.

(iii) Infrared (IR) and Radio Frequency (RF) are two types of wireless transmission used in Networks. Outline the differences in the way they work and give **one** example of where **each** type might be used.
IR: These devices must have line of sight between them as infrared signals cannot penetrate solid objects. This method is often used for wireless mice and keyboards.
RF: These devices don't need line of sight as radio waves can penetrate solid objects. As a result, RF is more suitable for LANs.

(iv) List **two** security risks when transferring files over a wireless network.
Virus, Email Spam, hackers, identity fraud, information access etc.

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

3(c) Image **X** has been edited using photo editing software to produce image **Y**. Image **Y** will be used in a printed report.

X

Y

(i) State **three** commands used to edit the image.
Crop tool, brightness, greyscale, flip rotate, hue, filter, saturation etc.

(ii) Suggest an appropriate file format to save the edited image.
Outline **two** reasons in support of your choice.
Jpeg, Gif etc.
Reasons: High compression ratio, reduction in file size, compatible file type etc.

OR

3(d)

(i) State the meaning of the term *compression* in relation to MP3 files.
This greatly reduces the amount of data required to represent the audio recording and still sound like a faithful reproduction of the original uncompressed audio for most listeners.

(ii) *"Illegal music downloading is contributing to a decline in music industry development."*

Discuss this statement, giving **two** points in support of the opinion outlined and **two** points against.
Support:
Downturn in music industry sales/economics, employment across music industry, closing high street music retail stores, loss of record contracts for emerging artists etc.
Against:
Wider audience for emerging artists, wider variety of music/global artists, availability/ accessibility etc.

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

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

4(a)

(i) Running shoes are often manufactured in developing countries such as China.
Give **one** reason why this is so.
Low cost manufacturing, any appropriate reason.

(ii) Give **two** negative effects on the environment caused by transporting goods long distances to their markets.
Pollution (air, noise) , carbon footprint, global warming, using up fossil fuels, greater chance of environmental disaster occurring e.g, oil spill and the danger to wildlife etc.

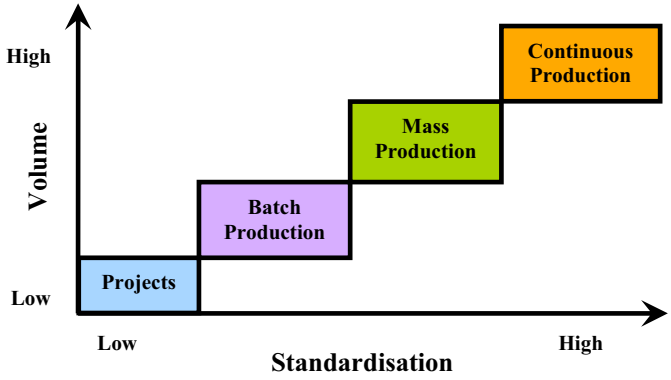
4(b)

Imagine that you are setting up a manufacturing system to make running shoes. You expect there will be a high demand for the shoes.

(i) Using the diagram shown, choose a suitable type of production process.
Mass Production

Give **one** reason for your answer.

Large volumes of production can be achieved, demand is stable and high, most consumer products are produced with this type of production etc.



(ii) Your manufacturing department is part of a large company. Name **two** other departments in the company. In each case, describe **one** important task they perform in relation to the production of the running shoe.

Human Resources, Finance/Accounting, Marketing, Suppliers etc.

Tasks performed

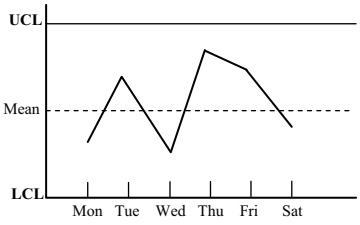
H.R:	**Hiring/firing, training, job design, legal requirements, union negotiations etc**
Finance/Accounting:	**Budgets, cost analysis, stockholder requirements etc.**
Marketing:	**Sales forecasts, customer orders, customer feedback etc.**
Suppliers:	**Orders, quality requirements, design specifications, material availability, quality data etc.**

(iii) Sports shops will not sell the shoes unless they are certain that they are of high quality.
Describe **three** key features of a system you would put in place to ensure that the shoes are of high quality.
Pareto principle, x-bar and r control charts, process capability, just in time (JIT) manufacturing etc.

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

4(c)

The quality of the stitching on the shoe is important. The control chart shown records the number of faults found over a week.



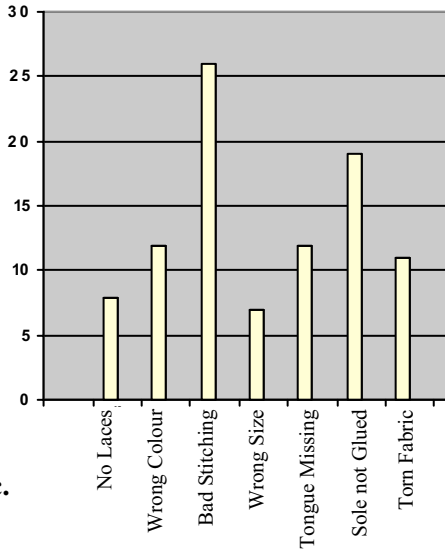
(i) What is meant by the terms **UCL** and **LCL**?
UCL: **Upper Control Limit** LCL: **Lower Control Limit**

(ii) What does the chart tell you about the quality of the stitching process?
The process is in control etc.

OR

4(d)

The bar chart shows the quality problems in the manufacture of the running shoe that occurred over one week.



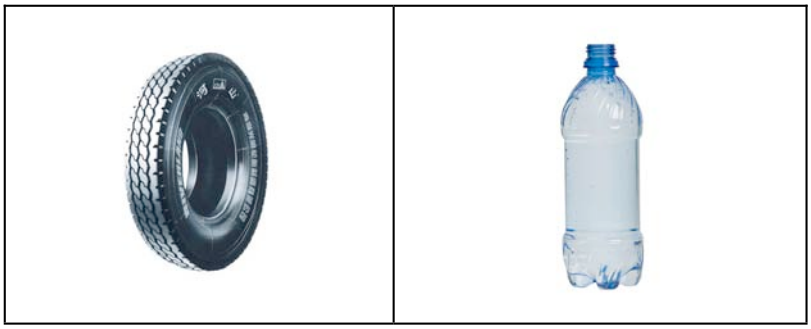
(i) Which **two** areas contribute most to the quality problems?
Bad stitching and sole not glued.

(ii) Describe a quality problem solving method that you would use to investigate **one** of these problem areas.
PDSA (plan, do, study, act) cycle, flow charts, bar charts, cause and effect diagrams, scatter diagrams, tally charts etc.

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

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

The graphics show a tyre and a water bottle.



(i) Name a suitable material for the manufacture of **each** item.
Tyre: **Rubber** Bottle: **PET etc.**

(ii) In **each** case, outline **two** properties of the material which make it suitable for the product.
Rubber: **Flexible, provides traction etc.**
PET: **Easy to mould, lightweight, recyclable, leak-proof etc.**

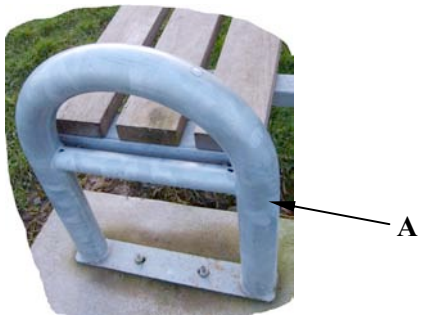
5(b)

The graphics below show a garden seat and a detail of its end frame **A**.

(i) Choose a suitable wood for the manufacture of the garden seat and justify your choice.
Suitable wood: **Treated softwood (pine) or any appropriate wood.**
Justification: **Cheap, sustainable, easy to machine etc.**

(ii) Identify **one** permanent and **one** semi-permanent joining method used in the garden seat. In **each** case, outline why the method of joining is appropriate.

Permanent Joint: **All of Support 'A' (welded)- strength, rigidity etc.**
Semi-permanent Joint: **Rails joined to the upright posts– ease of assembly, if a rail becomes damaged it can be replaced easily etc.**



(iii) The support **A** is made from tubular mild steel. Why is tubular mild steel a suitable material for the support?

Strength, hollow section allows it to bend easily into shape, welding can be used as a jointing method etc.

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

5(c)

(i) A moulded edge has been applied to the rails of the seat using a router. Sketch a suitable profile for the moulded edge and justify your selection.

Chamfer- It removes the sharp edge from the rail (any appropriate edging and justification).

List **two** safety precautions to be taken into account when using an electric router.

Ensure the cutter is set to the correct depth and is securely fastened before turning on the router,
Keep the power cable away from the cutter,
Always use proper safety protection when using the router (eye and ear protection) etc.

(ii) Name a metal other than tubular mild steel that would be suitable for the manufacture of the support **A**. Give **one** advantage and **one** disadvantage of this metal.

Metal: **Aluminium**
Advantage: **Light, Non-Ferrous etc.** Disadvantage: **Not as strong as steel etc.**

OR

5(d)

(i) Name an appropriate surface treatment and describe how it would be applied to the tubular steel bench supports.

Paint, Galvanising etc.

Application of paint: **Clean rust, dirt and grease from the metal, Score the surface, Apply a rust primer, Apply undercoats No.1 and No.2, Apply finishing coat.**

Galvanising: **Clean rust, dirt and grease from the metal, Dip the metal into a bath of zinc. The coating of zinc must not be touched until the item is cooled.**

(ii) Describe how students can reduce the adverse environmental impact of a project by their choice of materials.

Reduce the size of projects, reuse and recycle materials, minimise wastage from sheet material etc.

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