Coimisiún na Scrúduithe Stáit
State Examinations Commission

# Leaving Certificate 2011

# Marking Scheme

# Technology

## Ordinary Level

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*State Examinations Commission*

*Leaving Certificate Examination 2011*

# *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) Modern mobile phones have become multifunctional devices.
Name **two** functions they offer other than making phone calls.

**Clock, Calculator, To Do List, Games etc.**

(ii) Recently the mobile phone has developed into the Smart Phone.
Name **two** applications (apps) that can be used with a Smart Phone.

1. **Where am I : GPS access to longitude, latitude and altitude**

2. **Bump: Allows users to share phone details, emails etc. by simply holding phones close to each other.**

*(4 x 2 marks)*

**2.**

(i) Concrete is a *composite* material.
State the meaning of this term.

**It is composed of a number of materials that combine to form a versatile strong building material (Sand/ Cement /Gravel).**

(ii) Many *precast concrete* garden and building products can be purchased.
Give **two** examples of such products.

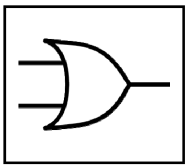
1. **Paving slabs**

2. **Ornaments, Cills etc.**

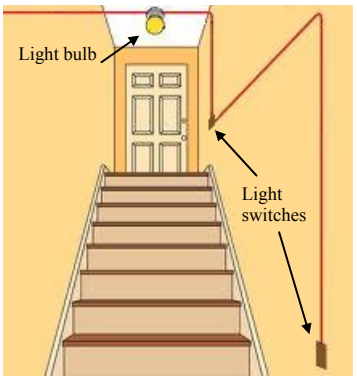
*(4+2+2 marks)*

**3**

In the box provided, draw the symbol for an **OR** gate suitable to activate the hall light from either switch.



**OR** gate

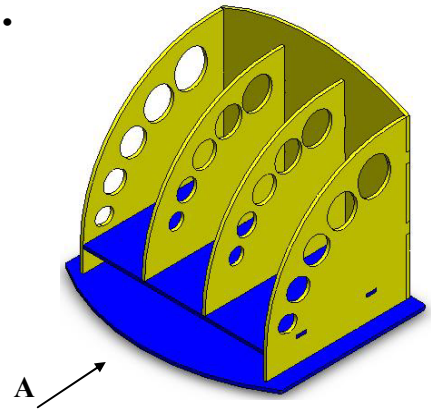


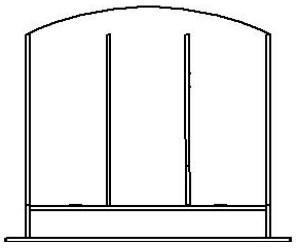

Complete the truth table for this logic gate.

| Switch A | Switch B | Light Bulb |
|---|---|---|
| 0 | 0 | 0 |
| **0** | **1** | **1** |
| **1** | **0** | **1** |
| **1** | **1** | **1** |

*(5+1+1+1 marks)*

**4.**



**Parallel lines-** *2 marks*
**Vertical Lines-** *2 marks*
**Curve-** *2 marks*
**Proportions-** *2 marks*

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

**5.** The image shows the rescue pod used in the Chilean mining rescue.

Give **two** questions that might be asked during the design stage of this rescue pod.

Question 1:

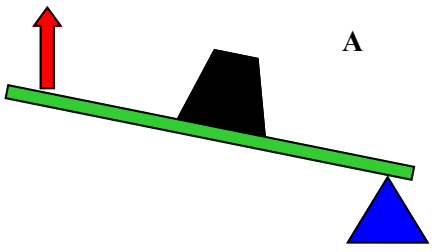
**Diameter/size of bore hole**

Question 2:

**Max height/ weight of miners etc.**

*(4+4 marks)*

**6.** Identify the class of lever shown in each of the graphics **A** and **B**.



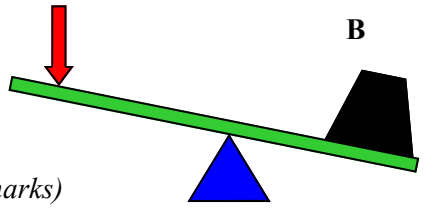

**A: Class 2**

**B: Class 1**

Give **one** everyday example of each class of lever.

**A: Wheelbarrow/ nutcracker.**

**B: Seesaw/crowbar etc.**




*(4 x 2 marks)*

## 7


your electricity bill

Bord Gáis Energy think beyond

Mr Sam Sample,
Any Street,
Any Town,
Any County

| METER NO. | METER READINGS | | ELECTRICITY USED | METER READING TYPES |
|---|---|---|---|---|
| | | | | |
| Z000001234 | 6010 | 5065 | 945 | |

AMOUNT €

Discount Tariff - Urban Day

| Description | Units | Rate | |
|---|---|---|---|
| Standing Charge | 61 days | 25.20 cent/day | 15.42 |
| 24 hour Units | 945 | 14.10 cent/kWh | 133.25 |
| Direct Debit Discount | | 12% | 15.99 CR |
| Total excluding V.A.T. | | | 132.68 |
| V.A.T. @ 13.5% | | | 17.94 |
| Invoice Total | | | 150.62 |

| PLEASE PAY BY | TOTAL € |
|---|---|
| Direct Debit | 150.62 |

Electricity used for domestic purposes is measured in **kWh**. Explain the abbreviation **kWh**.

**kWh: kilo Watt hour**

On a monthly bill a customer used 777 units of electricity at 14.10 cent/kWh. If there is a standing charge of €21.50, calculate the total amount due for payment excluding VAT.

**Total: €109.56 + €21.50 = €131.06**

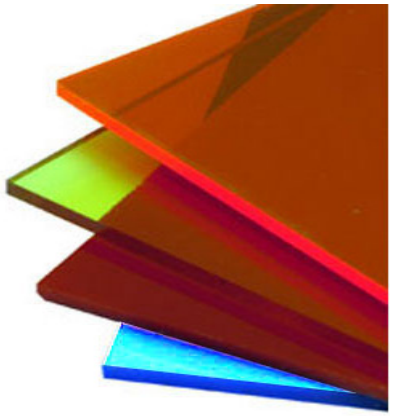
*(4+2+2 marks)*

## 8.

Students can enhance their project work by carefully selecting appropriate materials.
Give **two** benefits of choosing acrylic as a material for project work.

1. **Variety of colours**

2. **Easy to shape, no need to apply a finish etc.**



Outline **two** Health and Safety precautions you should observe when polishing the edge of a piece of acrylic.

1. **Be careful of sharp edges**

2. **Ventilation, protective gloves etc.**

**(***4 x 2 marks)*

## 9.

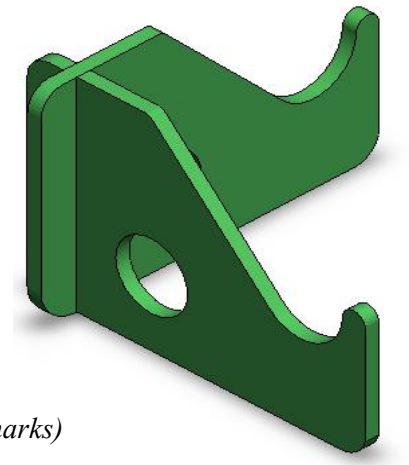
Explain the meaning of this label when it is seen on a product.


**Carbon Footprint Reduction Label. CO2 produced has been reduced to 100grams during manufacturing of this product etc.**

(Very good description - *8 marks*
Fair description - *4 marks)*

## 10.

The iPhone Holder shown is to be manufactured from acrylic.
List **four** main steps required to manufacture this item.



**1: Mark out shape on acrylic using template**

**2: Cut out shapes**

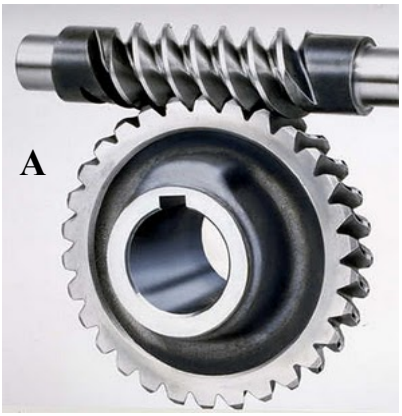
**3: Drill holes**

**4: File /Sand/Polish edges/**
**Glue using Liquid Solvent Cement etc.**

*(4 x 2 marks)*

## 11.

Name the gear arrangement shown at **A**.




**A**: **Worm and wheel gear system**

Outline o**ne** advantage of using this arrangement in project work.

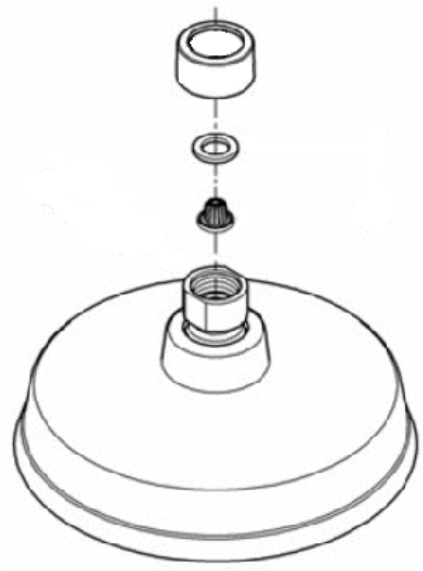
**Accurate adjustment/ no slippage**

Give **one** everyday application of this gear arrangement.

**Guitar head tensioner for strings etc.**

*(4+2+2 marks)*

## 12.



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

**Rendering/shadow etc.**

*(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) - 4 marks, (b) - 10 marks, (c) OR (d) - 10 marks***

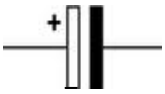
***2(a)*** The image shows a Faraday Induction Torch. Electricity is produced by shaking the torch, which in turn passes a powerful magnet back and forth through a coil of copper wire.

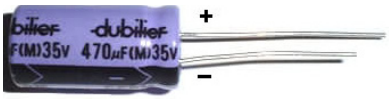

(i) Choose a suitable material for the manufacture of the **body** of the torch.
**ABS etc.**

(ii) Outline **two** properties of this material that make it suitable for the body of the torch.
**Durable, strong, easy to mould etc.**

***2(b)***

(i) Shown is the symbol for a component that could be used to store electrical charge in this torch. Using the formulae and tables booklet or otherwise, name this component.
**Electrolytic capacitor**




(ii) Make a pictorial sketch of this component, labelling the *anode* and *cathode.*

(iii) Typically, a torch uses *DC* electricity while a house light uses *AC* electricity.
Explain using notes and/or simple circuit diagrams the difference between AC and DC when referring to electricity.
**DC: Direct Current** **AC: Alternating Current**

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

***2(c)***

(i) Projects can have many objectives such as:

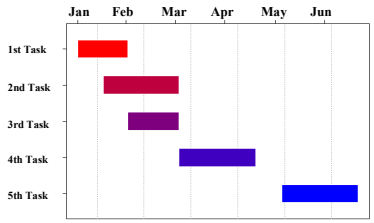
- satisfying the brief
- staying within budget
- meeting deadlines.

Describe **two** of the objectives outlined above.

**Satisfying the brief: meeting specifications**
**Staying within budget: Cost considerations**
**Meeting deadlines: Time considerations etc.**

(ii) Gantt charts are a popular technique for representing the stages and activities in a project.

Outline **two** advantages of using Gantt charts when undertaking project work.
**Visual representation of tasks/schedule, easy to interpret, software available etc.**




**OR**

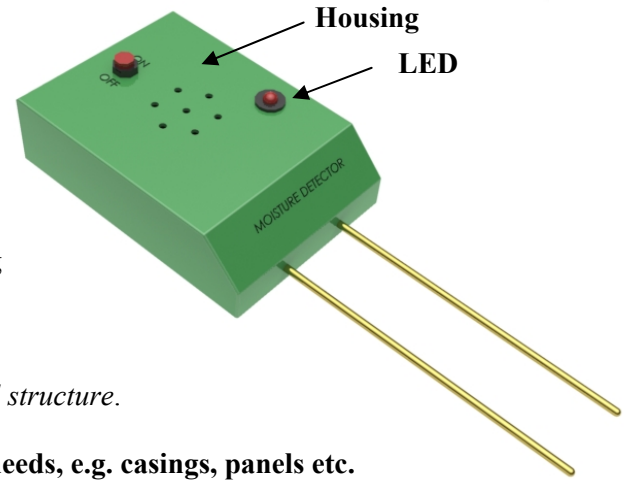
***2(d)*** Wind generators are used to generate electricity from the *kinetic energy* of the wind. This is a *renewable energy* source.

(i) Explain **each** of the terms :
*Kinetic energy* **of an object is the energy it possesses due to its motion etc.**
*Renewable energy* **is the energy which comes from natural resources such as sunlight , wind, tidal ,geothermal etc.**

(ii) Wind generators at sea produce significant quantities of electricity.
State **one** advantage and **one** disadvantage of wind generators **at sea**.
**Advantages: space, non-intrusive (visually) etc.**
**Disadvantages: maintenance, expensive to install, ship navigation etc.**

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

***(a) - 4 marks, (b) - 10 marks, (c) OR (d) - 10 marks***

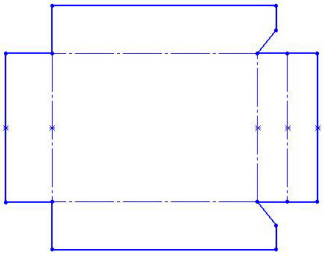



***3(a)*** The image shows an electronic moisture sensor. The sensor sounds a buzzer when dry conditions are detected.

(i) Describe using notes and annotated sketches a suitable method of manufacturing the housing for the circuit.
**Vacuum Forming etc.**

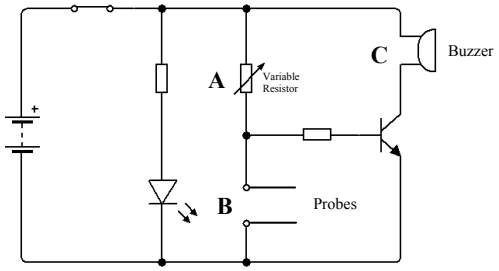
(ii) The completed housing is an example of a *shell structure*. Explain the term shell structure.
**A thin material shaped/moulded to specific needs, e.g. casings, panels etc.**

***3(b)***



(i) Draw a well proportioned freehand sketch of the surface development of the green housing indicating **all** fold lines.

(ii) The moisture sensor uses a light emitting diode (LED) as a 'power on' indicator.
Give **two** advantages of using an LED for this purpose.
**Neat, low energy usage, robust etc.**




(iii) Shown is the incomplete circuit diagram for the electronic moisture sensor.
Redraw the given circuit diagram to include the missing components at **A**,**B** and **C**.

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

***3(c)***

(i) Text is used to enhance the housing of the moisture sensor. Describe how this could be achieved.

**CAD, vinyl cutter or router etc.**

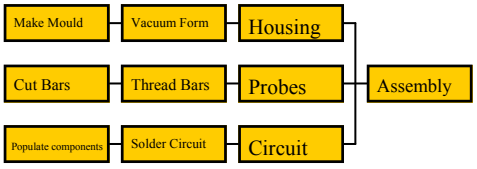

(ii) Graphics and logos are often added to commercial products. Outline **two** reasons for the addition of such graphics.

**Brand identification and promote sales etc.**

**OR**

***3(d)***

(i) Construct a Work Breakdown Structure (WBS) for the tasks associated with the manufacture of the moisture sensor.




(ii) Health and safety is an important aspect of project work. Identify **one** specific hazard associated with:

- drilling the housing
  **Clamped properly, support for housing etc.**
- threading the probes.
  **Burr removal, protection from cutting fluids etc.**

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

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

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

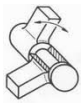
***1(a)*** (i) *Robotics* is a rapidly developing technology in the 21st century.
What is meant by the term robotics?
**Intelligent man made devices that can move by themselves, whose motion can be modelled, planned, sensed and controlled by programming.**

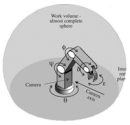
(ii) The graphic shows *Fluke*, a diving robot designed for deep sea exploration.
Give **two** examples of how robotics are used in deep seas.

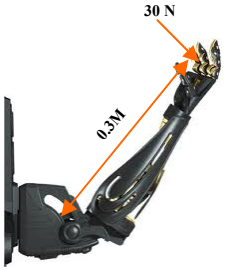
**Maintenance of pipe lines etc, exploration/recovery of ship wrecks/ planes etc.**

***1(b)*** (i) Explain any **two** of the following terms associated with robotics:

- Mechanical Gripper **Used to grab items by means of mechanical fingers etc**.
- Rotary Joint **A joint that rotates in an arc direction etc.**
- Work Envelope **The volume of space the robot works within.**








(ii) The humanoid arm requires various *degrees of freedom* to function properly. Identify any **two** degrees of freedom. In **each** case outline the importance of the degree of freedom identified, to the overall functionality of the arm.

**Shoulder pitch, elbow pitch, wrist pitch, yaw and roll, fingers etc.**
**Associated functionality etc.**

(iii) Calculate the moment acting about the elbow of this robotic arm if a load of 30N is acting on the hand.
**Moment = Force (Newton's) x Distance (Meters) = 30N x 0.3M = 9NM**

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

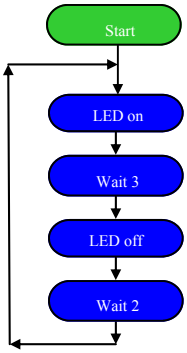
***1(c)***

(i) Peripheral Interface Controllers (PICs) can be purchased with many different pin arrangements. Outline **two** possible benefits of purchasing an 18 pin PIC rather than an 8 pin PIC.

**Greater number of inputs and outputs achievable, motor control etc.**

(ii) A red LED is to be used to indicate that a fire alarm is on standby. Draw a flowchart to give the following outputs:

- Turn on the LED for 3 seconds
- Turn off the LED for 2 seconds
- Repeat this process continuously.




**OR**

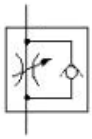
***1(d)*** The image shows a dentists' drill which is pneumatically powered.

(i) Suggest **two** reasons why pneumatic drills are used by dentists.

**Can produce high speed safely without generation of heat. Readily available power supply. Clean/no risk of fire etc.**

(ii) Identify the pneumatic component **A** below. Outline **one** benefit of using this component in a pneumatically powered dentists' drill.

**A**



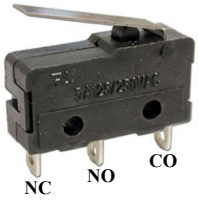
**A:** **Throttle Valve**

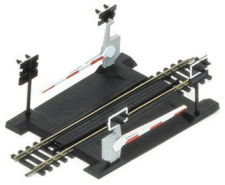
**Benefit:** **Speed control for the drill etc.**

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

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

***2(a)*** A student has designed a model railroad level crossing.

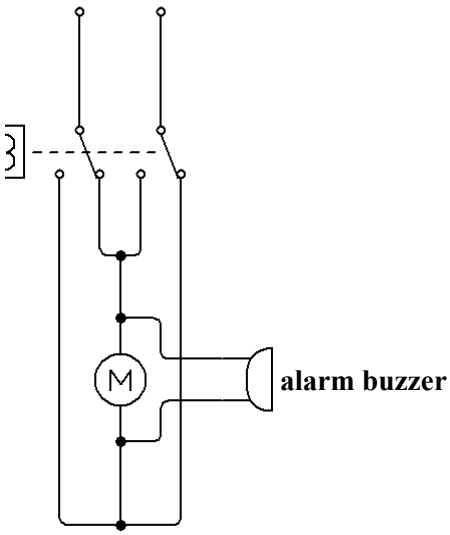


(i) Limits switches could be used to stop the barrier when it reaches its horizontal and vertical limits.
Make a labelled sketch of a typical limit switch.

(ii) Identify the *polarised* component **A** in the circuit at ***2(b)*** below.
What is meant by the term polarised?
**Component A - Diode**
**Polarised - Positively and negatively charged leads (legs) etc.**

***2(b)*** The student uses a circuit incorporating a transistor and a relay switch to control the model.



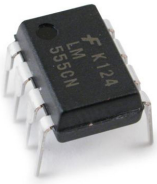

(i) What is the function of the transistor **B** in the circuit?
Explain why the student might use the transistor **B** in the circuit?
**Amplifier of current/automatic switch. Triggers the relay to operate etc.**

(ii) Explain briefly why the student used a relay switch.
**To operate a secondary circuit at a different voltage etc.**

(iii) Redraw the motor section of the circuit to incorporate an alarm buzzer which activates while the barrier is in motion.

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

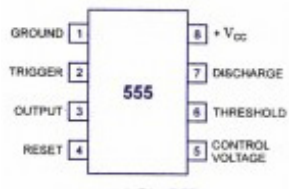
***2(c)*** The image shows an *IC* - the 555 *DIL* timer.




(i) Explain terms IC and DIL.

**IC: Integrated Circuit DIL: Dual in Line**

(ii) Using a simple sketch of a 555 timer identify pin number 1 and pin number 6.




**OR**

***2(d)*** *Prototype boards* are often used when producing PCBs.

(i) Give **two** reasons why prototype boards might be used in PCB production.

**Quick assembly, no soldering required, check functionality etc.**

(ii) Give **two** reasons why sockets are used in PCB production for certain electronic components.

**Protect electronic components such as ICs/ Allow ICs to be changed without the need to re-solder 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)*** To enable computers to process *analogue* data this data needs to be *digitised*.

(i) Explain the terms analogue and digital.

**Analogue: The way humans perceive information e.g. sound and light etc.**

**Digital: The way computers process information converting analogue values to ones and zeros etc.**

(ii) Explain the difference between RAM and ROM.

**RAM: Random Access Memory** **ROM: Read Only Memory**

***3(b)*** Developments in computers, microprocessors and the Internet have led to modern types of crime.

(i) "*Computer Hacking*" is one such crime.

Explain the term computer hacking.

**Illegally breaking through the securities of another computer system, allowing the hacker access to personal details such as passwords, bank details etc.**

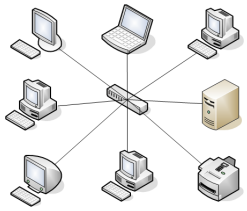
(ii) Give **two** examples of other types of computer crime.
**Internet fraud/ financial scams/child pornography and exploitation etc.**

(iii) Outline **three** ways in which computer users can protect themselves from computer crime.
**Use passwords, anti virus software, back up files and reformat in case of infection etc.**

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

***3(c)*** The manager of a small business must install a network so that different business departments can be linked.

A *"Star Network Topology*" is to be used for the network.



(i) Explain, using a simple sketch, the term Star Network Topology.

**Each computer is cabled to a central switch/hub which acts like a junction box allowing computers to communicate. Hub is connected to server.**

(ii) Outline **two** advantages of using a networked system.

**Shared peripheral devices (printers etc.), security and levels of access etc.**

**OR**

***3(d)*** A digital camera has many advantages over a traditional camera.

(i) Outline **two** such advantages.
**Image quality, editing of images, images can be emailed etc.**

(ii) Using notes and/or sketches, describe the main differences between vector and bitmap format images.
**Vector images: These images are basically a series of geometric objects such as lines and curves/resolution independent– logo creation etc.**

**Bitmap images: These are made up of a grid of pixels/resolution dependant/ can be edited at pixel level - photographs etc.**

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

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

(i) The way products are manufactured usually depends on the quantity required.
Name **three** Manufacturing Systems.
**Once Off Production, Batch Production, Mass Production, Continuous Production.**

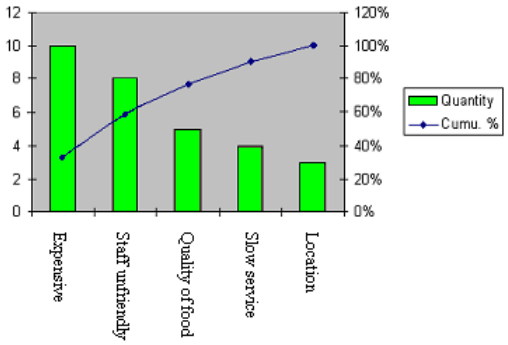
(ii) Identify a suitable manufacturing system for

- A daily newspaper
  **Batch Production**
- An oil rig
  **Once Off Production**


***4(b)*** It was Vilifredo Pareto who concluded that 80% of the problems with any process are due to 20% of the causes. This is known as the 'Pareto Principle'.

(i) Discuss the impact the Pareto Principle might have on a companies quality management strategy.
**Companies try to focus on the vital few problems that affect the quality of their product etc.**

(ii) The graph shows reasons for poor reviews of a new restaurant.
Identify the **two** most critical issues raised by the reviewers.
**Expensive and staff unfriendly**




(iii) Outline **one** strategy the owner of the restaurant could undertake to improve the situation.
**Reduce costs, staff training, change suppliers, advertising etc.**

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

***4(c)*** *Capacity management* is essential if a supermarket chain like SuperValu wishes to meet the needs of its customers on a consistent basis.

(i) Outline what is meant by the term capacity management.
**The demand for a product or service produced by a company can fluctuate over time. It is very important that an economical means of meeting the demand is devised etc.**

(ii) Outline **one** likely consequence of **each** of the following situations for a supermarket group such as SuperValu.
Their supermarkets:

- over stocked with products — **Price reduction to sell products, storage etc.**
- under stocked with products — **Customer complaints, loss in customers, reputation consequences etc.**

**OR**

***4(d)*** Successful companies such as Toyota and BMW rely greatly on their reputation.

(i) Why is the *Continuous Improvement Process* important to these companies?
**Continuous Improvement focuses on increasing customer satisfaction through continuous and incremental improvement of processes in turn leading to reduction of waste and hence costs in order to create excellence and acceptance etc.**

(ii) Explain the terms *Benchmarking* and *Reverse Engineering*.

**Benchmarking involves taking a product that is best in its class and using it as a basis for specifying the quality and performance of a proposed new product.**
**Reverse Engineering involves carefully dismantling and inspecting a competitors product to look at design features that can be incorporated into a new product etc.**

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

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

***5(a)*** An incomplete table of materials and products is shown below.

(i) Draw the table below into your answerbook and complete the missing information.

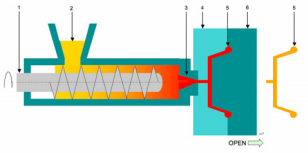
| Product | Material Classification | Material |
|---|---|---|
| Kite | Fabric | **Polyester, Nylon** |
| Jewellery | **Non– Ferrous metal** | Gold |
| Kitchen Table | Hardwood | **Oak** |
| Washing up Liquid Bottle | **Thermoplastic** | Polyethylene |

(ii) In the case of each of any **two** products, outline a property of its associated material which makes it a suitable material for this product.
**Any relevant properties for materials chosen etc.**

***5(b)*** The 3D graphic shows a design for a modern chair.

(i) Choose a material suitable for:
- the seat - **Polypropylene**
- the legs - **Tubular steel /Aluminium etc**.

(ii) Describe, using notes and sketches, a suitable method of producing the seat.
**Injection Moulding: Plastic granules dropped into rotating screw thread. These are heated turning them into fluid plastic. This is then injected under pressure into a shape mould. This is allowed to cool, the mould opens and the shape is released etc.**



(iii) Outline **two** reasons why this chair may be more suited to office use rather than domestic use.
**Stackable for storage, easy to clean, cost etc.**

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

***5(c)***

(i) Describe using notes and annotated sketches a suitable method of joining the seat to the legs.
**Nut/bolt/screw fixture - any relevant annotated sketch etc.**

(ii) Suggest a suitable finish for the legs. Outline **two** reasons why this finish would be suitable for an office environment.
**Chrome, paint, powder dip coated etc.**
**Reasons: appearance, corrosion protection etc.**

**OR**

***5(d)***

(i) Artificial hip joints need to be made from materials that are *hard wearing*, *non-corrosive* and *fracture resistant*.

With a focus on functionality, describe why it is important to manufacture artificial hip joints with these properties in mind.
**Prevent degradation of ball and socket joint, prevent seisure, prevent damaging of components etc.**


(ii) Recently *DePuy* recalled one of their hip replacement products due to long term complications for patients.

Outline **two** health and safety issues that can affect human beings through selecting inappropriate materials for hip replacements.

**Infection, swelling, canceragenic inducing elements etc.**