Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2020

Marking Scheme

Technology

Higher Level

Note to teachers and students on the use of published marking schemes

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2020

Technology

Higher Level

Marking Scheme

Section A - Core *(72 marks)*

Section A. *Answer **any twelve** questions. All questions carry 6 marks.*

1. The 'National Policy Framework on Alternative Fuels Infrastructure for Transport in Ireland 2017 to 2030' has been published. This policy framework sets an ambitious target that by 2030 all new cars and vans sold in Ireland will be zero carbon emissions.

Name **two** zero carbon emission fuels used for vehicles.

Hydrogen fuel cells, solar, battery power, etc.

(3 + 3 marks)

2. The gold, silver and bronze medals for the Tokyo 2020 Olympics are being made from 78,985 tonnes of recycled electronics, including 6.21 million recycled mobile phones, according to the Tokyo Olympics 2020 medal project.

Outline **two** reasons for the use of gold in electronic components.

Excellent electrical conductor, does not tarnish, malleable – can be formed into thin sheets, etc.

(3 + 3 marks)

3. Biometric Reverse vending machines are common across the world. Ireland's first reverse vending machine has been installed in Carrickmacross, Co Monaghan. The machine identifies plastic PET bottles by barcode and dispenses vouchers in return.

(i) Explain the abbreviation PET.

Polyethylene terephthalate.

(ii) Outline **one** challenge in recycling plastic bottles.

Mixed materials for bottle and top, small amount of plastic gathered for each bottle, public perception of value of recycling, availability of recycling facilities, etc.

(3+3 marks)

4. (i) Name the mechanism shown.

Worm and wormwheel

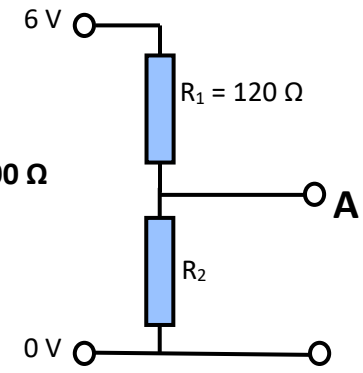
(ii) Explain the *self-locking* feature of this mechanism.

The driving motor is attached to the worm, this will drive the wormwheel with a speed reduction.
The wormwheel will not drive the worm creating a mechanism that will allow movement only when the worm is driving.

(2 + 4 marks)

5. (i) A circuit requires a 5 V supply. Find a value of R_2 in order to deliver a 5 V supply at A.

Vout = (R2/R1+R2) x Vin
Vout = (R2/120+R2)x6 = 5
Therefore R2 = 600 Ω
Alt: Voltage divider rule: The voltage drop across both resistors when combined is 6V. Drop in voltage across 120 Ω = 1 V, drop in voltage across R2 = 5 V, therefore R2 = 120 Ω x 5 =600 Ω



(ii) The resistor R_1 has a red tolerance band (± 2%).
Calculate the maximum and minimum values of the resistor.

Max value = 122.4 Ω
Min. value = 117.6 Ω

(4 + 2 marks)

6. Briefly assess the suitability of a spreadsheet application to:

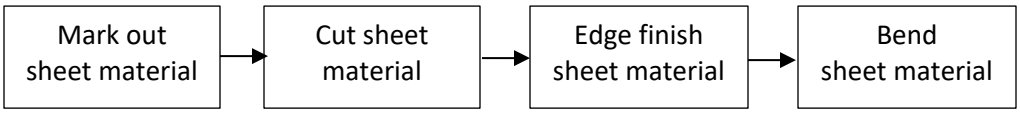
(i) Store information: **Spreadsheets will store significant volumes of data.**

(ii) Process numerical data: **Excellent ability to process and manipulate numerical data**

(iii) Edit images: **Limited ability to edit images**

(2 + 2 + 2 marks)

7. Compile a *Work Breakdown Structure* (WBS) for the acrylic table menu holder shown.



(6 marks)

8. The Minister for Communications has proposed a new Online Safety Act targeting cyberbullying, material that promotes self-harm or encourages nutritional deprivation. It is proposed that an Online Safety Commissioner be appointed to enforce such regulations.

(i) Explain the term *cyberbullying*.
Cyberbullying is a form of bullying or harassment using electronic means. Also known as online bullying, it has become increasingly common, especially among teenagers as technology has advanced.

(ii) Outline the importance of *privacy settings* in the prevention of cyberbullying.
The degree of access to personal information allowed by the user of social media accounts. A personal profile is created with access categorised as public (open to all), friends/followers (can be viewed by nominated people who may then chose to share with others) or locked (restricted access which can manage access to friend on a case by case basis)

(3 + 3 marks)

9. Soldering electronic components on circuit boards can be hazardous.

(i) Outline a source of fumes from soldering that could be a health hazard.

The melting of resin core in solder, use of other fluxes, burning protective coatings on circuit boards while soldering, etc.

(ii) Describe a method of minimising this hazard.

Use of extraction systems to remove fumes generated by soldering

(4 + 2 marks)

10. Snowboards are designed and manufactured from a range of materials, laminated to produce the finished board. The structure includes a wooden core, metal edge, fibreglass sheet and printed plastic coversheet.

Complete the chart below by naming materials that may be used in the manufacture of a snowboard. The first entry has been completed for you.

Part	Material	Reason for choice of material
Composite layer	Fibreglass	Strong and flexible material
Wooden core	**Ash**	**Able to withstand impact**
Metal edge	**Copper**	**Can be formed into shape, will not rust**
Plastic coversheet	**PVC**	**Can be printed, forms into strong colourful sheets**

(2 + 2 + 2 marks)

11. The LED display shown is limited to a current of 15 mA with a voltage drop of 1.95 V. The supply voltage is +6 V.

Calculate the value of the current limiting resistor that should be used for the display.

Calculation:

V = 6 - 1.95 = 4.05 V

I = 15 mA = 0.015 A

$$\mathbf{R = \frac{V}{I} = \frac{4.05}{0.015}}$$

= 270 Ω

(6 marks)

12. Website effectiveness can be analysed using information similar to that shown below to establish data on visits to the landing page and length of time spent on the site.

Sessions	Users	Page views	Pages/session
624,935	299,488	5,826,244	9.32

Explain the terms:

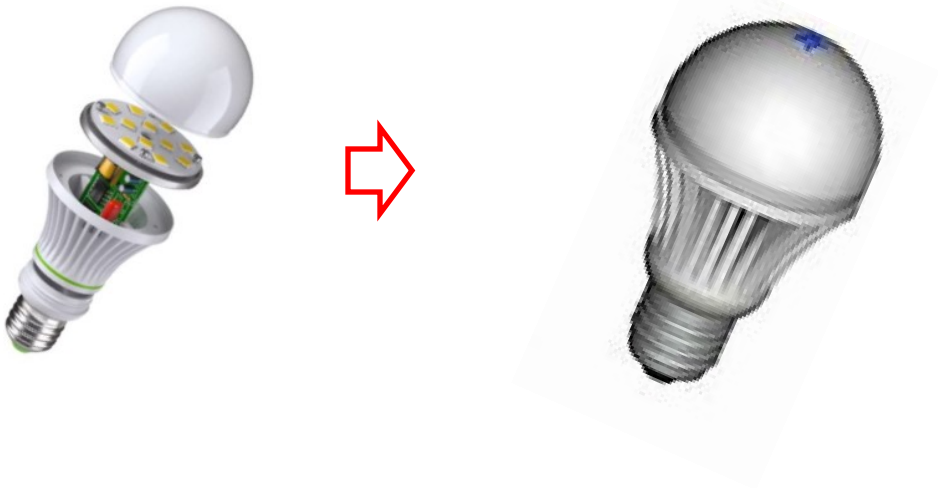
(i) cookie: **Data sent from a website and stored on the user computer, it is designed to reflect user preferences while browsing.**

(ii) landing page: **The page of a website that appears as a result of a search engine link or advertising link.**

(iii) 9.32 Pages/Session: **The average number of pages viewed during a session on a website.**

(2 + 2 + 2 marks)

13. The LED bulb below is shown in an exploded view. Sketch a pictorial view of the **assembled** LED bulb.



(6 marks)

14. An e-scooter uses a 24 V electric motor attached to a drive mechanism to propel the machine. The motor is rated at 2750 RPM and 252 W.

(i) Calculate the maximum current drawn by the motor.

I = P / V
= 252 / 24
= 10.5 A

(ii) If the driven gear **A** has 96 teeth and the driver gear on the motor has 12 teeth, calculate the rotational speed of the driven gear at maximum motor RPM.

Gear ratio = 12 : 96 = 1 : 8

2750 x 12 = o/p x 96

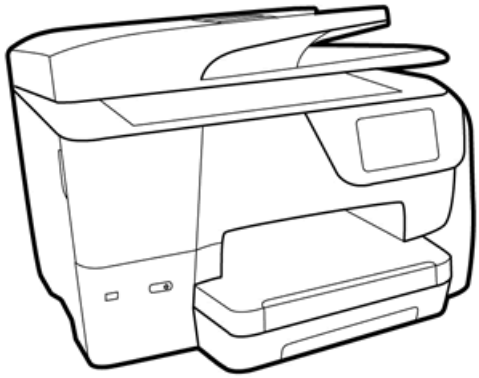
o/p = (2750 x 12) / 96
= 343.75 RPM

Alt: Driven Speed= G.R x input speed

1/8 x 2750 = 343.75 RPM

(3 + 3 marks)

15. Use **two** techniques to enhance the graphic representation of the fire extinguisher shown.



Any two graphic techniques

(6 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.*

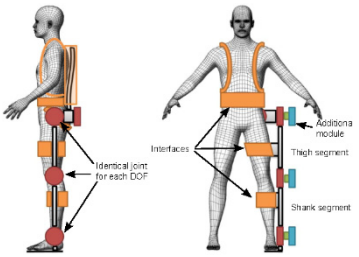
All questions in Section C carry 40 marks.

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

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

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

2(a) (i) Suggest **two** safety elements that should be integrated into the exoskeleton suit.
Anthropometric design, durable materials, use of sensors, weight of battery, etc.



(ii) Describe, with annotated sketches, a method of strapping the exoskeleton to the human body.
A sketch showing the use of fabric straps/Velcro etc.

(8 marks, 4+4)

2(b) The Lightcycle™ lamp by Jake Dyson is influenced by the construction industry and is adjusted manually by pushing the arms.

(i) Suggest a possible inspiration from the construction industry for the design of the Lightcycle™ lamp.
Design based on tower crane, cantilever bridges etc.

(ii) Outline, using annotated sketches, how the production of the roller-and-groove system shown could be manufactured.
The roller wheel could be made by casting or moulding nylon.
A metal bearing system is added to complete the roller.
The groove profile could be extruded using aluminium, etc.

(iii) Describe, using annotated sketches, mechanised systems to adjust height **A** and rotary movement **B**.
A- Rack and Pinion system, B- Worm/worm wheel system or servo motor, etc.

(10 marks, 2+4+4)

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

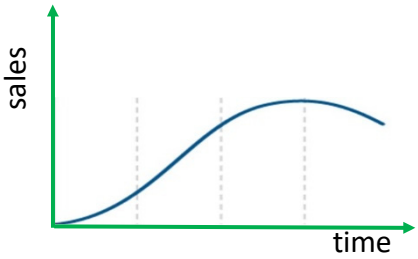
2(c) (i) Briefly outline how adjusting light colour, intensity and brightness of the lamp might have a positive impact on user wellbeing.
Quality lighting can reduce glare, headaches, eyestrain, skin conditions and improve visual comfort.

(ii) Suggest the purpose of the heat pipe and outline its possible effect.
To draw away heat from the LED, therefore prolonging the lifespan of the LED.

(6 marks, 2+4)

OR

2(d) (i) Draw a typical product life cycle graph to represent product sales over time.



(ii) Using the Dyson Lightcycle™ lamp as an example, describe **each** of the stages in a product lifecycle.

Introduction: **After all research and development is complete, the product is launched. Few competitors, low sales, slow for the market to accept the new product.**

Growth: **The market has accepted the product and sales begin to increase. Improvements can be made to the product to stay competitive.**

Maturity: **Sales will reach their peak. Other competitors enter the market with alternative solutions and increasing competition.**

Decline: **Sales/demand begin to decline as the product reaches its saturation point. Most products are phased out of the market at this point.**

(6 marks, 2+4)

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

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

3(a) Food appliances such as blenders, mixers and whisks improve efficiency in preparing fresh foods.

(i) Suggest **two** technological advances that could make such appliances more energy efficient.
Advancements in electro-mechanical control, design of parts, better materials, etc.

(ii) State **two** technologies used in the preservation of food.
Refrigeration, vacuum packing, canning, etc.

(8 marks, 4+4)

3(b) A food processor is driven by an electric motor with a range of speed options. A gear system is used to rotate the beater shafts.

(i) Describe a means of producing a range of speeds and reversal of rotation.
Use of gearbox motors, worm and worm wheel, continuous servo motors, motor reversal circuits, decrease voltage etc.

(ii) The gears shown are made from nylon. Give **two** reasons for choosing nylon to produce the gears.

Hardwearing, will machine effectively, absorb heat, quieter than metal gears, no lubricant needed, etc.

(iii) The gears **A** and **B** drive the beaters. Calculate the rotational speed of the beaters when the motor runs at 2000 RPM.

Gear ratio of worm wheel is 50:1. Speed of beaters = 40 RPM

(10 marks, 4+3+3)

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

3(c) (i) Distinguish between ergonomics and anthropometric data in product design.
Ergonomics: Designing products, systems or processes to take account of the interaction between them and the people who use them.
Anthropometric data refers to systematic measurement of the physical properties of the human body. Measurements such as height, weight, body mass index (BMI) and body circumferences, etc.

(ii) Describe, with annotated sketches, one ergonomic feature and one anthropometric feature of the hand blender shown.
Ergonomic feature: Design of blender that provides neutral holding angle for wrist.
Cord is designed not to interfere as a person uses the hand blender.
Anthropometric feature: Shape of grip which is designed to fit the shape of a human hand, etc.

(6 marks, 2+4)

OR

3(d) Compare the environmental footprint of the boxes making reference to manufacturing processes, material properties and recyclability.

Expanded polystyrene: polystyrene beads are expanded using heat (pre-expansion). After a cooling off period, the beads are then moulded into the required shape- energy intensive. Properties include being lightweight, a very good insulator and moisture resistant. Expanded polystyrene is not commonly recycled, etc.
Cardboard: least environmental impact- its manufacture has very low CO2 and oil emissions compared to other materials. Properties include lightweight and strong.
Cardboard is recyclable, etc.

(6 marks, 3+3)

Section C - Options

*Answer **any two** of the five optional questions.*

(a) - 10 marks, (b) - 16 marks, (c) OR (d) - 14 marks

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

1(a) (i) Explain the notation 1×10^{-9} metres.

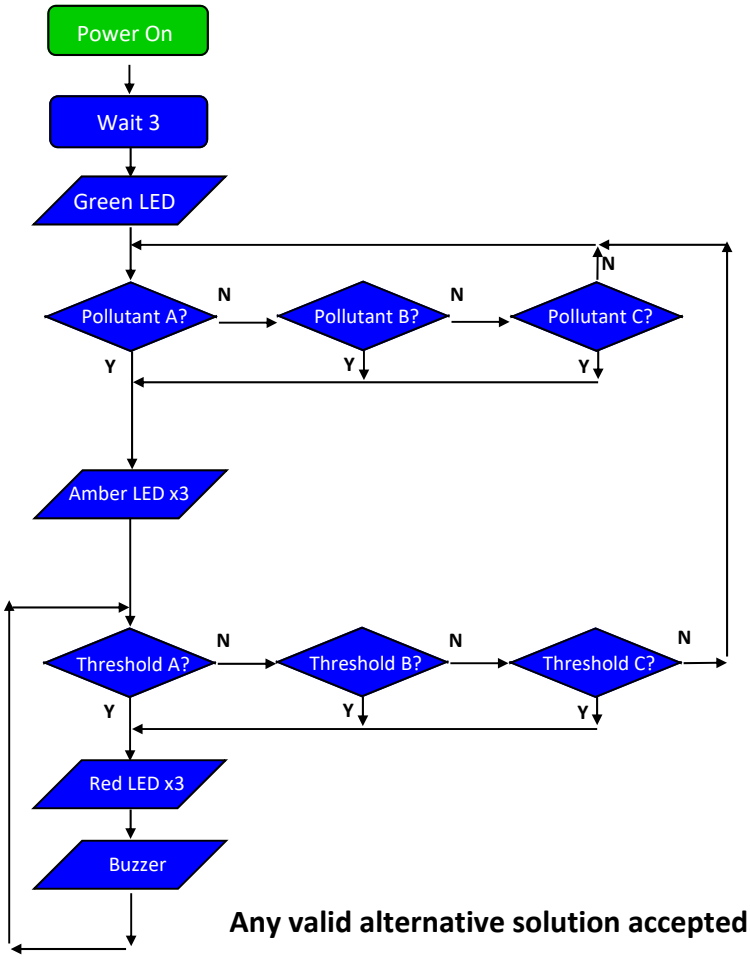
1×10^{-9} metres = 0.000 000 001 metres.
One billionth the size of a metre (extremely small scale).

(ii) Suggest **two** uses for nanorobotics in medicine.

Accessibility to all parts of a human body, Ability to conduct non-evasive research, conduct delicate surgical procedures, etc.

(10 marks, 4+6)

1(b) (i) Draw a flowchart for the operating sequence of the device.



Any valid alternative solution accepted.

(ii) Modify your flowchart to include an alert if pollutant levels remain high for more than 10 minutes.

Any valid modification accepted.

(iii) Suggest a method of transferring the data from the device to a smart phone.

NFC, Bluetooth, etc.

(16 marks, 8+4+4)

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

1(c) (i) Outline the principles of a closed-loop system of control.

The key feature of this system is that feedback is used to improve the accuracy and operation of a robot. Typically, sensors monitor the performance of the robot, adjusting the operation of the robot as necessary, etc.

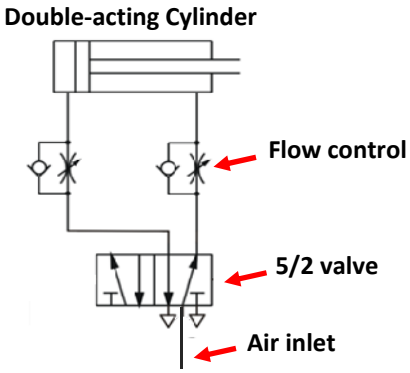
(ii) Describe, using annotated sketches, an end-effector that could be used to pick strawberries without bruising.

Suction gripper, mechanical gripper, etc.

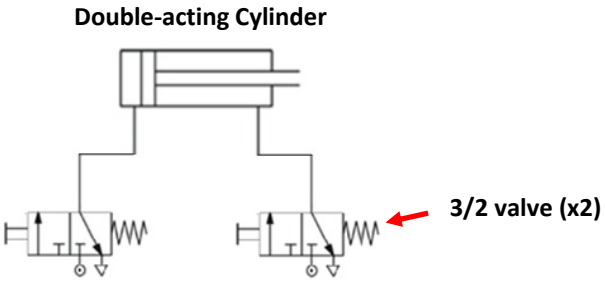
(14 marks, 8+6)

OR

1(d) (i) Draw a pneumatic circuit diagram to operate the double-acting cylinder on the sheet metal cutter.



Alternative solution:



(i) Describe another suitable application for a double-acting pneumatic cylinder.

Opening and closing gates/doors, factory automation and packaging, moving items on and off conveyor belts, etc.

(14 marks, 8+6)

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

(a) - 10 marks, (b) - 16 marks, (c) OR (d) - 14 marks

2(a) (i) Outline **two** advantages of using flexible printed circuits (FPC)

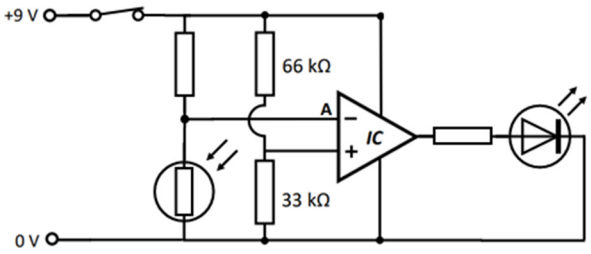
More robust, reliability, can eliminate the need for additional connectors and cables, etc.

(ii) Describe **one** application for such flex circuits.

Aviation, hearing aids, calculators, printers, etc.

(10 marks, 6+4)

2(b) (i) Complete the circuit



(ii) Describe how the circuit operates making reference to the IC and voltage at A.

An op amp is used as a comparator. It has two inputs, V+ (non-inverting input) and V- (inverting input). In the circuit, the voltage at V+ is 3 V due to the arrangement of the potential divider of the 66kΩ and the 33kΩ resistors. The resistor and LDR act as another potential divider. The voltage at A varies depending upon the resistance of the LDR, which changes with the levels of light. When the voltage at V+ is greater than the voltage at A (V-), then the output will be high. In this circuit, an LED is activated when the output is high.

(iii) Describe **two** reasons for the use of surface mount ICs.

Reduced manufacturing costs, faster production- less drilling required, etc.

(16 marks, 6+6+4)

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

2(c) (i) Outline two reasons for the use of glass in the outer layer of the PV panel.

Protect the PV panel, it also offers low reflection, high strength, etc.

(ii) Explain the operation of a PV system making reference to equipment, energy conversion and supply of AC current.

Equipment: includes of a panel of small photovoltaic cells connected together. PV cells are made from semiconducting material, silicone being the most used.

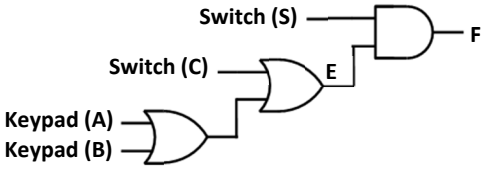
Energy conversion: (light to electrical) Particles of light knock electrons free from atoms, generating a flow of electricity.

The PV panels produce DC supply which then converted to appliance-friendly AC supply using an invertor, etc.

(14 marks, 8+6)

OR

2(d) (i)



(ii)

A	B	C	E	S	F
0	0	0	0	0	0
0	0	1	1	1	1
0	1	0	1	1	1
0	1	1	1	1	1
1	0	0	1	1	1
1	0	1	1	1	1
1	1	0	1	1	1
1	1	1	1	1	1

(14 marks, 8+6)

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

(a) - 10 marks, (b) - 16 marks, (c) OR (d) - 14 marks

3(a) (i) Outline **two** advantages of the use of subscription services for access to music or movies.
Unlimited access to many songs/movies, convenience, value, etc.

(ii) Distinguish between annual licence, perpetual licence and consumption licence as models of subscription services.
An annual license will allow a customer to use the licensed software for one year only.
A perpetual license allows a customer to use the licensed software indefinitely.
A consumption license allows a customer to pay only for what is being used.

(10 marks, 4+6)

3(b) (i) Compare the main features of ASCII and Unicode as forms of code for information interchange.
ASCII- American standard Code For information interchange is used by smaller and less-powerful computers to represent both textual data 9letters, numbers, and punctuation marks) and non- input device commands (control characters)
Unicode uses different languages and scripts where each letter, digit, or symbol is assigned a unique numeric value that applies across different platforms and programs.

(ii) Describe with annotated sketches, the setting up of a LAN for three wired computers and a shared printer. Make reference to equipment used, security and setting up procedures.
Equipment: network switch/router, ethernet cable, computer, printer etc.
Security: use of firewall, antivirus software, etc.
Settings: Configure LAN proxy settings, etc.

(iii) Explain each of these terms.
Pharming: the fraudulent practice of directing internet users to a bogus website that mimics the appearance of a legitimate one, in order to obtain personal information such as passwords, account numbers, etc
Phishing: A fraudulent attempt to obtain sensitive information such as usernames, passwords, personal information, or banking details by electronic communication, often posing as a legitimate communication.
Baiting: Baiting occurs when hackers entice the curiosity or greed of a victim online. It often involves the promise of an item or goods that the victim may want, to access their personal data.

(16 marks, 4+8+4)

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

3(c) (i) Suggest **two** reasons for the increasing use of solid state storage for tablet technology despite the extra cost.
Increased durability, faster, more reliable long-term storage, etc.

(ii) Explain the possible effect of sudden movement or physical shock on magnetic media.
Damage to drive, loss in data, accessibility issues, etc.

(14 marks, 8+6)

OR

3(d) (i) What is cloud computing?
The use of a network of remote servers hosted on the Internet to store, manage and process data, rather than a local server or a personal computer.

(ii) Outline **two** advantages and **two** disadvantages of cloud computing.
Advantages - cost savings on storage devices, reliable and consistent storage, eliminate updates and maintenance, effective access, etc.
Disadvantages - if internet connection fails data cannot be accessed, responsibility for security of data is transferred to provider, etc.

(14 marks, 6+8)

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

(a) - 10 marks, (b) - 16 marks, (c) OR (d) - 14 marks

4(a) (i) Explain the term Design for Environment (DfE).

Design for the Environment (DfE) is a design approach to reduce the overall human health and environmental impact of a product, process or service, where impacts are considered across its life cycle.

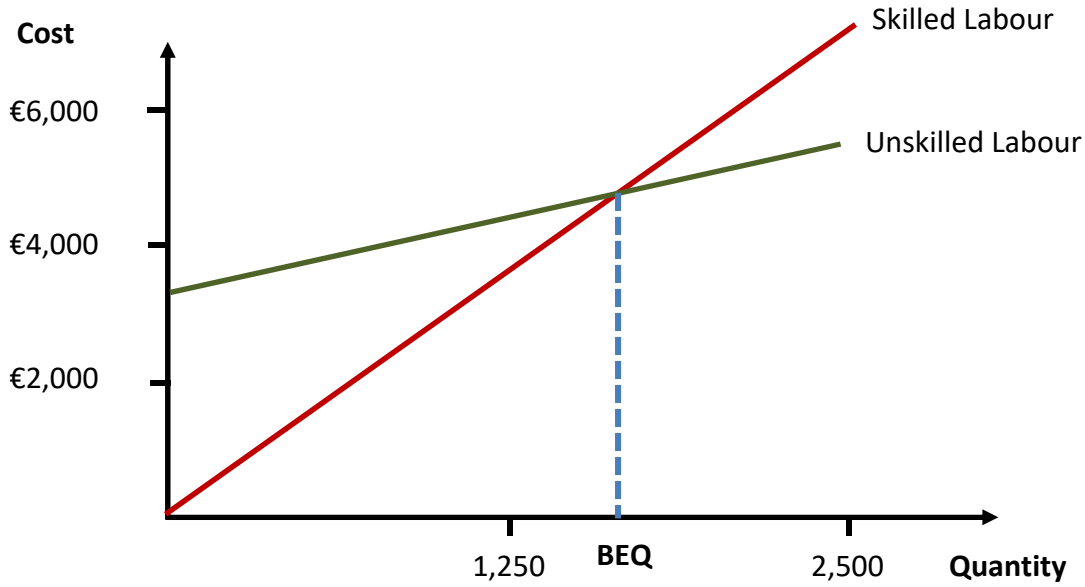
(ii) Explain each of the following Fairphone features in terms of DfE:

The modular design: **designed that each part is created independently, can be modified, replaced or exchanged with other modules, etc.**
Fair employment conditions for workers: **workers are paid a fair price for their work to allow them to afford life's essentials like food, education and healthcare.**

Phone supplied without charger, case, earphones or USB-C cable: **A reduction in accessories encourages consumers to re-use old chargers and cables. By not providing a case and earphones (non-essential items) there will be less waste when the products reach their end-of-life cycle.**

(10 marks, 4+6)

4(b) (i) Draw a graph to show the cost of manufacturing the coasters using both methods. Find the BEQ.



BEQ = Setup Cost/ (Manual cost per item) – (Automated cost per item)
= **€3600 / €2.55 - €0.52 = 1773 items**

(ii) Suggest **two** additional costs that might be incurred by changing to a fully automated process.
Capital investment in new machinery, ongoing maintenance costs,
staff redundancy packages, etc.

(iii) Outline **one** feature which could be highlighted when marketing a manually produced item and one feature which could be highlighted when marketing a machine produced item.
Manual: bespoke custom-made produced items
Machine produced: accuracy, speed of production, etc.

(16 marks, 8+4+4)

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

4(c) (i) Describe, with specific examples, each of the following potential sources of waste in business or in manufacturing:

Defects:	**Knots in timber may need to be removed before the timber is used for manufacturing purposes.**
Time:	**Production lines that fail can lead to a waste in labour time.**
Production:	**Faulty machines can result in poorly manufactured parts.**
Stock:	**If stock is not available, this can lead to production ceasing, etc.**

(ii) Explain the principles of continuous-flow manufacturing and just-in-time production.

Continuous-flow manufacturing: **Continuous Flow Manufacturing (CFM) is a methodology that aims at the optimisation of a process using minimum inventory. This is achieved by manufacturing a product, from start to finish, in one production line. CFM is associated with just-in-time and kanban techniques and it contrasts with batch production.**

Just-in-Time (JIT) production: **suppliers are coordinated with the manufacturing company; products are delivered in line with market demand. This reduces the amount of stock stored with less materials, parts, tools and space used. Advantages include quick response to demand, less investment in storage, quick turnaround of products, increased workforce flexibility, waste reduction, etc.**

(14 marks, 8+6)

OR

4(d) (i) Outline **two** problems of planned obsolescence for the consumer and **two** benefits of planned obsolescence for the manufacturer.
Problems: Items no longer usable, unwanted waste/clutter, etc.
Benefits: Opportunities to modify/enhance designs, increase sales, market dominance, etc.

(ii) Describe, with examples, each of the following dimensions of quality:
Durability: measures the length of life of the laptop which can be used until it is no longer economical to use the device.
Perceived quality: This is a subjective assessment a customer makes about a product/service resulting from image, advertising, or brand names. For a phone, this might be shaped by advertising or magazine reviews.

(14 marks, 8+6)

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

(a) - 10 marks, (b) - 16 marks, (c) OR (d) - 14 marks

5(a) (i) Explain the roles of once-off production and batch production in vehicle development.

Once-off production: Bespoke parts can be prototyped using this method which allows for potential designs to be evaluated, etc.

Batch production: Injection moulding dies are produced to manufacture large numbers of plastic objects such as tail-lights for a new model of car.

(ii) Suggest **three** materials suitable for use in the manufacture of the ePalette vehicle and give a key property of each.

Glass- transparent allowing athletes to look out in multiple directions.
Rubber- providing grip for floor coverings, handrails, etc.
Steel/carbon fibre- strength for the shell of the vehicle, etc.

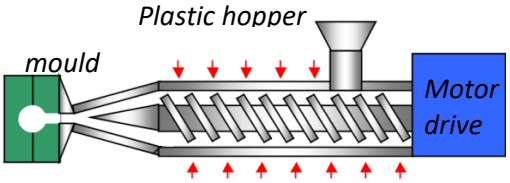
(10 marks, 4+6)

5(b) (i) Suggest a material, manufacturing process and surface finishing technique for the manufacture of the holding rails.

Mild steel – cost effective, strong and machines well. Tubular steel is bent to shape and welded. Plastic coated finish will protective surface from rust and give a surface warm to the touch.

(ii) Describe, with annotated sketches, a method of manufacturing the plastic seats.

Injection moulding: plastic pellets are loaded from the hopper through the heated chamber. It is pushed into the seat shaped mould by the rotating screw.



Heated chamber with screw drive

(iii) Outline **three** features of the ePalette vehicle interior designed with user safety in mind.

Accessibility with low floor and wide doors, safety railings brightly coloured, soft seats, seats folding to create space, clear markings, etc.

(16 marks, 4+8+4)

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

5(c) (i) Distinguish between a scroll saw and a bandsaw making reference to type of cutting blade, motion of cutting blade and operator safety.

Scroll Saw: fine tooth blade with holding pins at both ends of the blade. This blade reciprocates as it cuts through materials. Typically, this saw has a safety guard and emergency stop button.
Bandsaw: **Blade is a continuous band that is tensioned between two pulleys in the bandsaw. The blade moves in one direction as it cuts. The blade is protected by a guard and the machine typically has a surface-mounted emergency stop button and a foot emergency stop button**.

(ii) Outline, with annotated sketches, the steps required to produce a square cut-out in the middle of the circular workpiece shown.

Mark out square, drill holes, file to lines, etc. **Alt: CAD/CAM process explained, etc.**

(14 marks, 8+6)

OR

5(d) (i) Explain, using an example, the term *single use plastic*.

Intended only to be used once then thrown away or recycled, e.g, plastic straws.

(ii) Outline **one** way in which **each** of the following could reduce their use of single use plastics.

Food industry: use biodegradable materials in cups, plates, etc.
Schools: Encourage the use of reusable water bottles, etc.
Home: Avoid purchasing food with excessive plastic packaging, use metal cutlery, etc.

(14 marks, 6+8)