Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2019

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, 2019

Technology

Higher Level

Marking Scheme

Section A - Core *(72 marks)*

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

1. Technological development has revoluntionised the ways in which products are developed. Give **one** example for **each** heading below illustrating the impact of technology on the development of a mass-market drone.

(i) Research: **Internet research of existing solutions, skype, video conferencing, etc.**

(ii) Prototyping: **CAD modelling, 3D printing/Laser cutting of design models, use of polymorph, etc.**

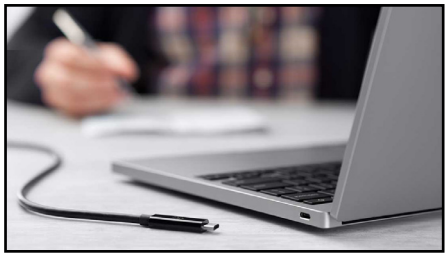
(iii) Manufacture: **use of CAM for mass production, robotic assembly, wide range of manufacturing techniques,etc.**

(2+2+2 marks)

2. The USB-C (or USB Type C) connector is increasingly seen on a range of devices, such as the laptop shown.
Outline **two** advantages of USB-C over other USB connectors.

Any two advantages:

Reversible connection,
faster speed of data transfer,
larger power output, etc.



(3+3 marks)

3. In the context of information security, *social engineering* refers to the manipulation of people to divulge personal and confidential information using techniques such as phishing or vishing.

(i) What is 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.

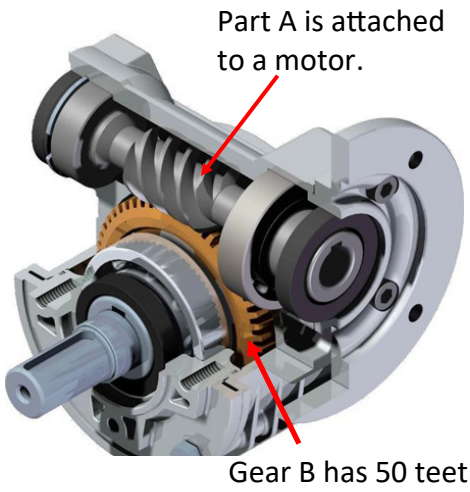
(ii) Outline **one** method of guarding against social engineering.
Beware of unsolicited emails, check company details independently, be suspicious of download offers, never divulge personal information, anti-virus software, etc.

(3+3 marks)

4. (i) Name the mechanism shown in the graphic.

Worm and wheel

(ii) If the motor rotates at 300 RPM, determine the time taken for Gear **B** to complete one full revolution.



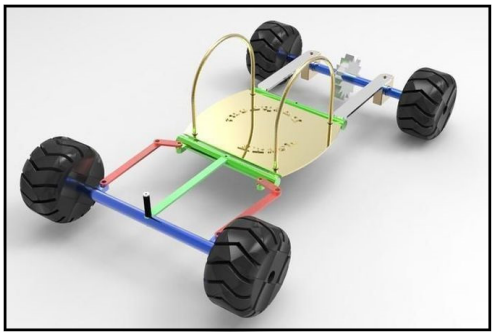
Calculation:

$$\frac{300}{50} = 6 \text{ RPM}$$

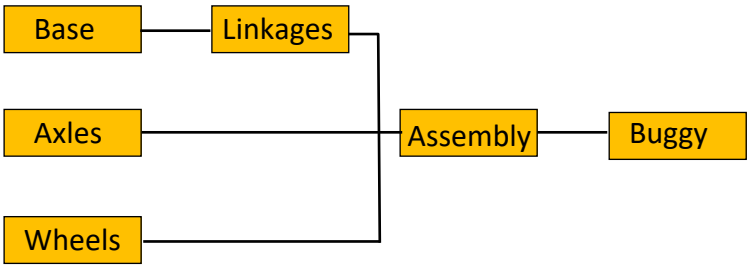
1 revolution takes 10 seconds

(2+4 marks)

5. Compile a simple Work Breakdown Structure (WBS) for the manufacture, in a school workshop, of the buggy shown.



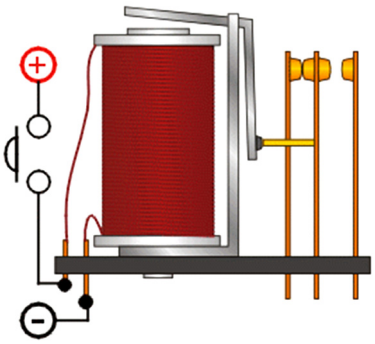
WBS:



Any valid alternative WBS accepted.

(6 marks)

6. (i) Describe the operation of the electronic component shown.



An magnetic field is produced to magnetise the iron core when current flows through the coil. The armature will then force the contacts to touch and activate the secondary circuit.

(ii) Explain the abbreviations associated with this device.

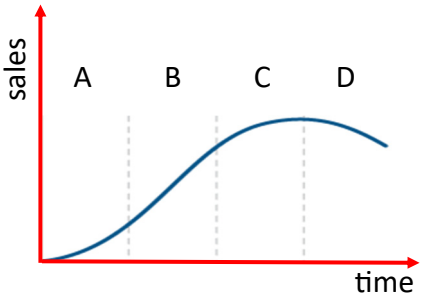
NC **Normally Closed**

NO **Normally Open**

COM **Common**

(3+3 marks)

7. New products exhibit recognised phases following the launch and introduction phase (A). Name **each** of the phases B, C and D of the lifecycle graph shown.



B **Growth**

C **Maturity**

D **Decline**

(2+2+2 marks)

8. The design and finish of the exercise machine shown is of high quality. The manufacturer also requires that the machine operates quietly.

Describe, using annotated sketches, how the pedals and their connecting shaft can be designed to operate with a minimum of noise.

Suggested solution:

(3+3 marks)

9. Mamukko is a Kinsale based company that creates bags from selected reclaimed sails, liferafts, leather and other textiles. Each Mamukko bag is handcrafted in their workshop.

(i) Outline briefly the process of upcycling.

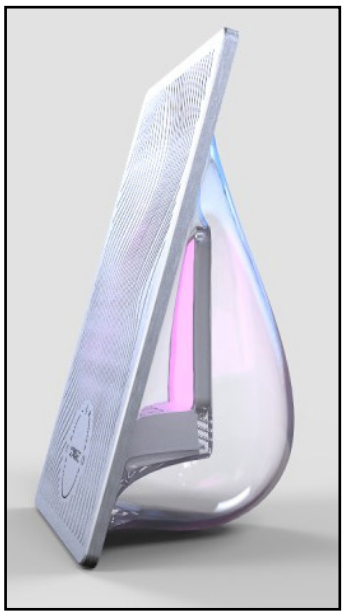
Creatively reuse old/waste materials/products to manufacture a new product, etc.

(ii) State the impact of upcycling has on cost of materials **and** on processing a handcrafted bag.

Materials are likely to be cheaper then processed materials.
Processing by hand is more labour intensive but will produce unique products. Some manufacturing processes may have been carried out prior to the upcycling, e.g., dyeing, waterproofing, etc.

(3+3 marks)

10. Sonarc, an Irish company, has created the world's first full audio speaker which has no moving parts.



(i) State **one** energy conversion that takes place in an audio speaker.

Electrical energy to sound (vibration),
A traditional speaker converts electrical to mechanical energy to sound energy.

(ii) Outline **two** advantages of designing an audio speaker with no moving parts.

Should increase the life of the device, wear will be reduced, sound quality should not deteriorate, reduced size, etc.

(2+4 marks)

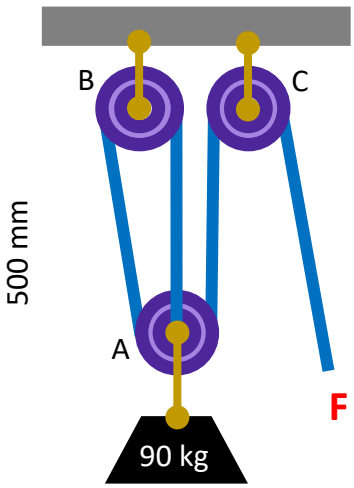
11. The pulley system shown is used to assist in raising heavy loads.

(i) Calculate the work done to raise the 90 kg weight through 500 mm by applying a force at **F**.
Assume g = 9.81 m/s^2

Calculation:

F = mg = 30 × 9.81 = 294.3 N (due to pulley configuration)

Work done **= Force × distance**
= 294.3N × 0.5m
= 147.15 J



(ii) Explain the term of *mechanical advantage*.

Mechanical advantage is a ratio of output force (load) to the input force (effort).
This allows a large load to be moved with a smaller effort.

(4+2 marks)

12. Using an appropriate example, describe briefly how a product might be tested against a design specification.

Any valid product and testing procedure explained.

Selected product: **Food Mixer**

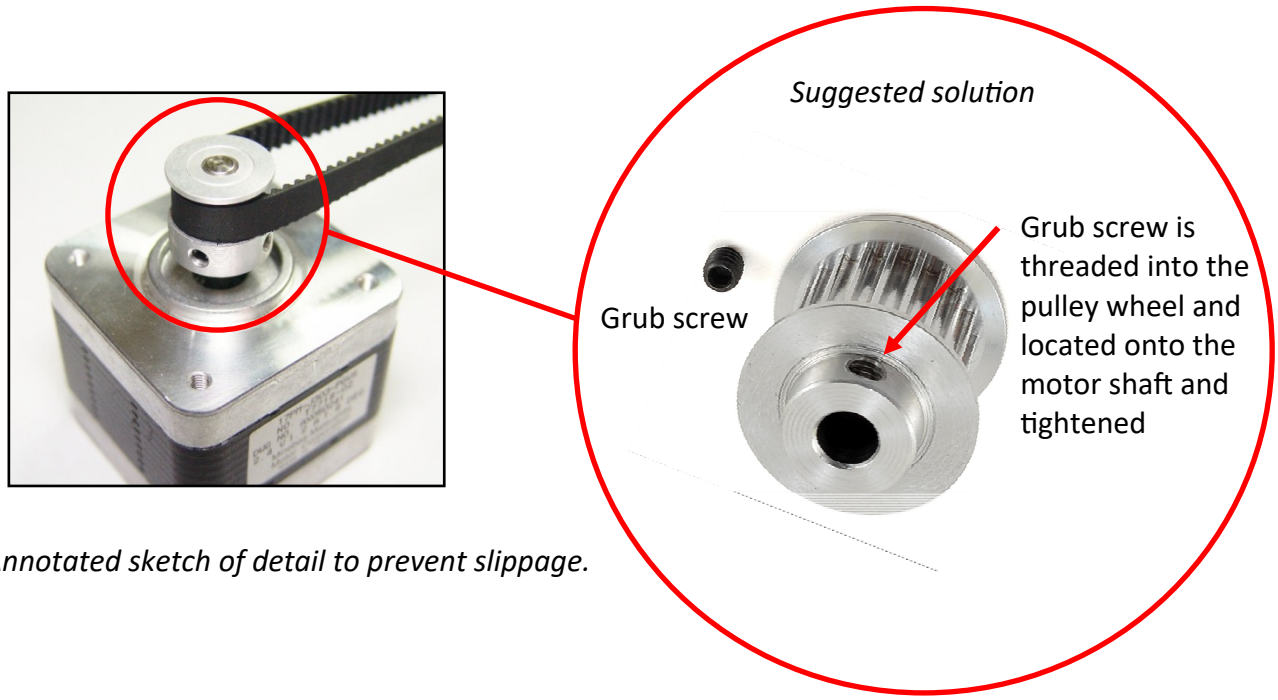
Testing procedure:

Test for functionality:
A simple test would be to verify that the various operational speeds of the food mixer perform as intended. Once products are fully assembled in a factory, samples of food mixers could be identified for testing purposes. Turn on the food mixer using the different speed settings. Any product that passes this test is fit for purpose. Any faults identified would need to be referred to relevant department to be resolved, e.g., design, manufacture or assembly.

(6 marks)

13. The pulley-wheel shown is driven by the motor.

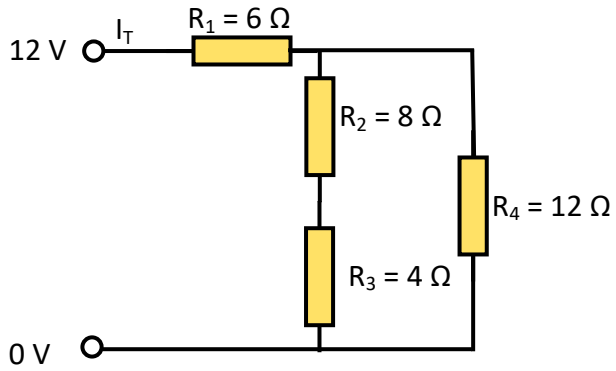
Make a sketch showing how the pulley could be located on the motor shaft to prevent slippage.



Annotated sketch of detail to prevent slippage.

(6 marks)

14. (i) Calculate the total resistance of the circuit shown.



Calculation:

$R_5 = R_2 + R_3 = 8 + 4 = 12\Omega$

$\frac{1}{R_6} = \frac{1}{R_5} + \frac{1}{R_4} = \frac{1}{12} + \frac{1}{12}$ $\quad R_6 = 6\Omega$

$R_{total} = R_1 + R_6 = 6 + 6 = 12\Omega$

(ii) Calculate the current (I_T) drawn from the 12 V supply.

Calculation:

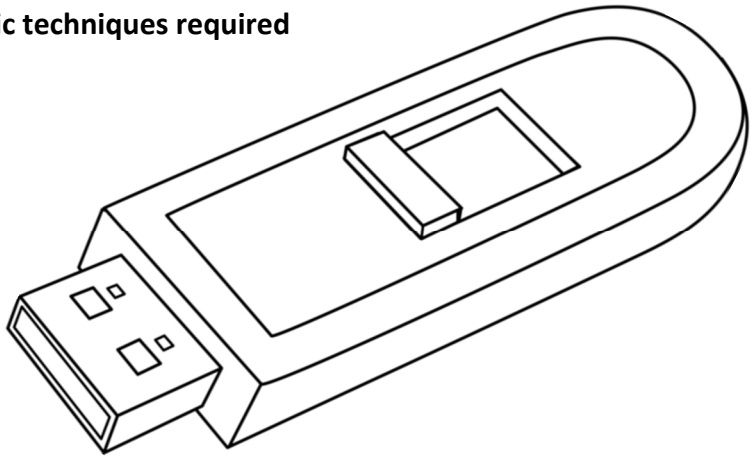
$V = I \times R$

$I_T = V / R_{total} = 12 / 12 = 1$ A

(4+2 marks)

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

Two distinct graphic techniques required



(3+3 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.

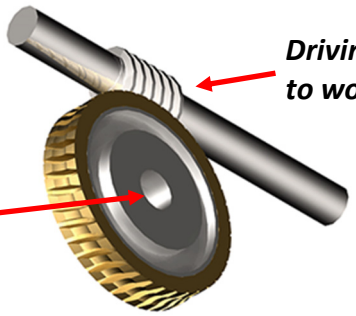
Section B - Core - *Answer Question 2 **and** Question 3.*

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

2(a) (i) Suggest a means of storing the energy generated during the daytime, for use at night or later.
Charging up battery packs from solar energy, use of capacitors to store charge, etc.

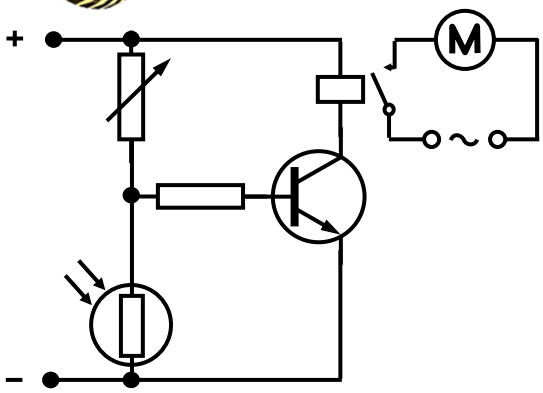
(ii) If a home uses 6500 kWh of electricity annually, calculate the percentage of this requirement that the typical 3 kW solar panel system described above may provide.
2600/6500 x100 = 40% *(8 marks, 4+4)*

2(b) (i) Outline, using annotated sketches, a method of providing smooth and precise movement, in two axes, for a solar panel similar to that shown.



Alternative solutions: Servo, stepper motors, etc.

(ii) Draw a suitable circuit to detect reducing light levels and activate a mains powered motor.



(iii) Analyse the information provided and discuss the advantages and disadvantages of the **tracked** system.
Advantages: provides maximum output for longer, reaches full output earlier, remains at full output for longer, etc.
Disadvantages: circuits more complex, require power to operate, maintenance of moving parts, etc. *(10 marks, 4+4+2)*

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

2(c) (i) Outline **one** design feature of the bird's nest stadium that maximises the use of natural light.
Open frame structure, bowl shape design, use of materials, reflection of light, etc.

(ii) Define **each** of these forces.
Tension—opposing forces try to stretch object.
Torsion—twisting force.
Shear—offset forces will cut object. *(6 marks, 2+4)*

OR

2(d) Explain **each** of the following techniques, employed to enhance structural strength.

Triangulated frames: **Frame members attached to distribute load (strong rigid structure)**
Alloying: **Mixture of two or more metallic elements to enhance material properties, e.g., strength and corrosion resistance, etc.**
Corrugated structures: **Thin materials bent/shaped (parallel ridges and furrows) to improve structure rigidity, etc.**

(6 marks, 2+2+2)

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

3(a) Outline **one** reason for using anti-gravity treadmill technology for:

- Rehabilitation from injury:
  Allow strengthening to start earlier (weight taken off injured limb), measurable outcomes, etc.
- Professional athletics and sports:
  Recovery is faster, specific strengthening can be targeted, can train for longer periods without risk of injury, etc.

(8 marks, 4+4)

3(b) (i) List **three** desirable properties of the material chosen to make the belt of the treadmill.
Durable, lightweight, non-slip, shock absorbent, etc.

(ii) Suggest, using annotated sketches, a method of minimising vibration while the treadmill is in use.
Cushioned rubber feet, feet mounted on springs, roller bearing systems used on roller shafts, rubber mat placed underneath treadmill, etc.

(iii) Describe, using annotated sketches, how the individual sections of the treadmill belt, might be connected to form one continuous belt as shown.
Thin composite backing material, use of chain links to join individual sections, etc.

(10 marks, 4+3+3)

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

3(c) (i) Give **two** electrical safety features of a typical mains-powered treadmill.
Emergency stop/panic button, electrical brake, tether with a clip attached to power cut-off in case of an accident, speed limiter, etc.

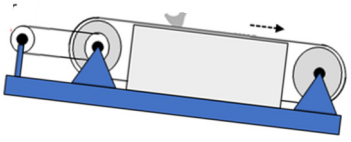
(ii) Outline the purpose of any sensing system commonly used with a modern treadmill.
To monitor personal conditioning and alert with over-exertion,
To regulate speed, prevent overheating of treadmill, etc.

(6 marks, 2+4)

OR

3(d) (i) Outline **one** electrical method and **one** mechanical method of varying the output speed produced by an electric motor.
Electrical - control of current to motor, programmable control, etc.
Mechanical - variable speed gearbox, cone or stepped pulleys, etc.

(ii) Describe **one** method of adjusting the incline of a treadmill.



Use of a screw mechanism, hydraulic systems, pneumatic systems, etc.

(6 marks, 4+2)

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

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

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

1(a) (i) State **three** specific applications of NFC technology.
Payment systems, loyalty cards, 'clocking-in' attendance systems, parking access, data exchange between devices, etc.

(ii) Describe **two** possible limitations of NFC technology.
Security of devices, cost, limited operational distance, small amount of data transfer etc.

(10 marks, 6+4)

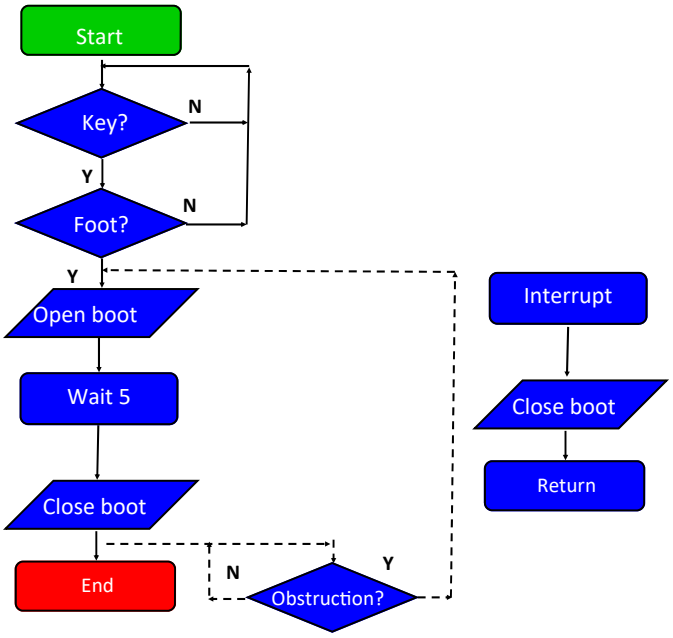
1(b) (i) Draw a flowchart for the operating sequence of the boot door system.

(ii) Add a flowchart modification that will detect an obstruction on closing the boot door and return it to the open position.
An additional compare block (obstruction) could be added as shown.

(iii) Detect the movement of a leg:
Motion or vibration sensor, LDR/light-operated sensor, etc

The presence of a key: **IR, Bluetooth, etc**

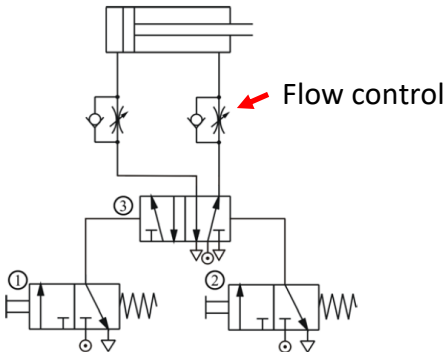
Any valid alternative solution accepted.



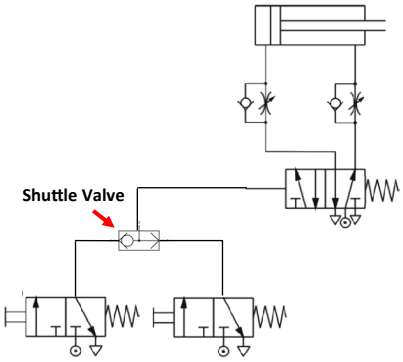
(16 marks, 8+4+4)

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

1(c)



To activate with a controlled speed

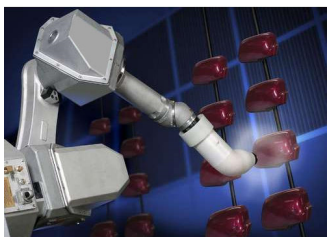


To operate in conjunction with a shuttle valve

(14 marks, 8+6)

OR

1(d) (i) Describe, using annotated sketches, a method of programming a robot to spray paint components on a production line.
Lead/walk through programming, offline programming, etc.



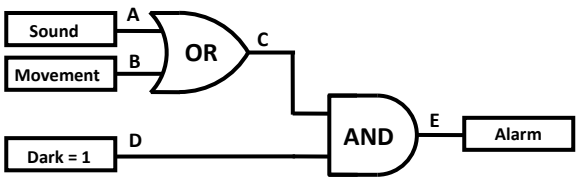
(ii) Explain the importance of accurate and consistent positioning of components on an automated production line.
To eliminate errors or faulty components, reduce unnecessary costs, time efficiency, etc.

(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)



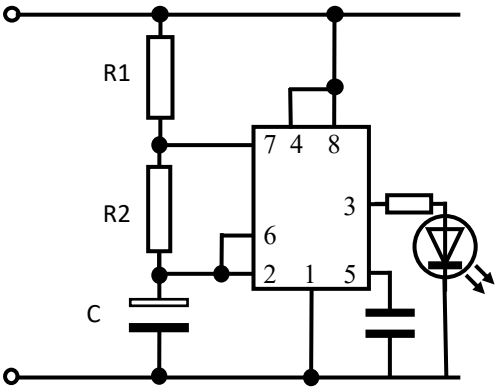
A	B	C	D	E
0	0	0	0	0
0	0	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	1	0	0
1	0	1	1	1
1	1	1	0	0
1	1	1	1	1

Truth Table

(ii) Suggest input **and** output electronic components for this circuit.
Input: Microphone, Motion senor, LDR, etc. Output: Siren, Buzzer, etc.

(10 marks, 6+4)

2(b) (i) Identify the pins on the IC and complete the circuit to include an LED output.



(ii) Describe how the flash rate of the LED could be adjusted.
Adjust the size of the resistors and/or the capacitor.

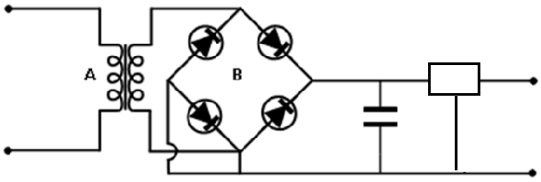
(iii) Calculate the frequency:
$f = 1.44 / (R_1 + 2R_2) \times C$
$= 1.44 / (2000 + (2 \times 39000)) \times 0.00001$
$= 1.8$ Hz

(16 marks, 8+4+4)

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

2(c)

(i) Circuit a circuit diagram of a regulated power supply:



(ii) Outline the function of **each** of these key elements of a mains-operated power supply which are listed above.

Transformer (A) - changes 220V mains voltage to a suitable level (e.g., 12V) for a power supply
Rectifier (B) - changes AC to DC
Regulator (C) - maintains the output DC voltage at a desired level, e.g., 7805 output is 5 volts.

(14 marks, 8+6)

OR

2(d) (i) Explain what is meant by *back EMF*.
Electro-Motive Force. When the armature of a DC motor rotates under the influence of a driving torque, the armature conductors move through the magnetic field and hence an EMF is induced, as in a generator. Back EMF flows in the opposite direction to the applied voltage.

(ii) Outline **two** reasons why a DC motor does not reach 100% efficiency.
Heat loss, friction in the motor bearings, energy loss in copper windings, etc.

(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) Explain the terms Virtual Reality and Augmented Reality.

(i) **Virtual reality (VR) implies a complete immersion experience that shuts out the physical world.**
Augmented reality (AR) adds digital elements to a live view often by using the camera on a smartphone. Examples of augmented reality experiences include Snapchat lenses.

(ii) Outline your understanding of OSS (Open Source Software).
Open-source software is computer software in which source code is released under a license in which the copyright holder grants users the rights to study, change and distribute the software.

(10 marks, 6+4)

3(b) (i) Distinguish between a WLAN and a WWAN.
WLAN - **wireless local area network that uses high frequency radio signals to transmit and receive data over a small area such as home, office or building.**
WWAN - **wireless wide area network covers a much larger area giving public access through telecommunication networks.**

(ii) Name and describe the function of components **A, B, C** and **D**.
A - Firewall - **a network security system that monitors and controls outgoing and incoming network traffic based on predetermined settings.**
B - Router - **a network device that directs data between computer networks.**
C - Network switch - **connects devices together on a single computer network**
D - Wireless Access Point - **wireless devices that allow Wi-Fi or Bluetooth devices to connect to a computer network.**

(iii) Suggest **two** features to increase the functionality of the LAN:
Additional devices or services could be added e.g., printing capability, wireless repeaters to strengthen signals, smart board, etc.

(16 marks, 4+8+4)

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

3(c) (i) State **one** advantage and **one** disadvantage of using a WPAN.
Advantage: easy free access, connect multiple devices at once, etc.
Disadvantages: security, theft of data, short range, slow data transfer, etc.

(ii) Explain the impact of **both** *absorption* and *reflection* on the performance of wireless technologies.
Absorption: Signals are weakened as they pass through different materials, e.g., wood and concrete have high absorption rates.
Reflection: As signals makes contact with materials, they are reflected which can cause interference of the signal if a large amount of reflection takes place,
e.g., metals are highly reflective. *(14 marks, 8+6)*

OR

3(d) (i) Explain **three** elements of the URL shown below.
https:// - **Hypertext Transfer Protocol Secure,** *www.* - **worldwide web,**
rugbyworldcup.com - **domain/host name,** */supporters* - **filename**

(ii) Blog: **a website that contains online personal reflections, comments, links, videos and photographs provided by the writer.**
Wiki: **a website that allows anyone to add, delete or revise content using a web browser**
Podcast: **a digital media file, or series of files, distributed over the internet**

(14 marks, 8+6)

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, using specific examples, **any two** of these priorities.

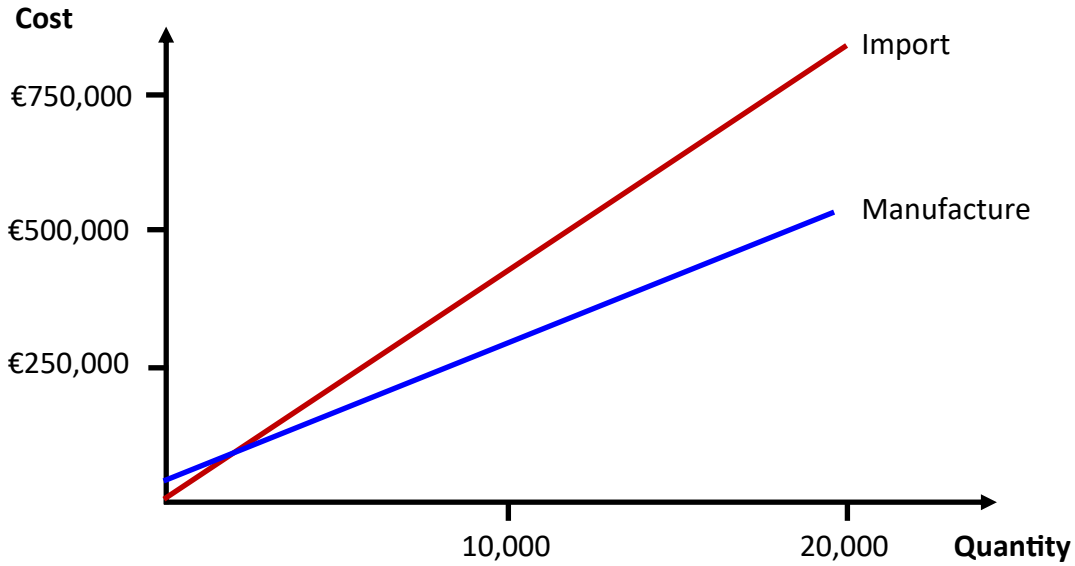
Cost: **competing with lowest price e.g., low cost supermarkets**
Quality: **building superior product e.g., high specification car brands**
Flexibility: **allows user customising in design of product e.g., computer companies building devices to customer requirements**
Speed**:** **fast and efficient delivery of product, e.g. fast food restaurants**

(ii) Distinguish between an *order qualifier* and an *order winner*.

An order qualifier is a characteristic of a product or service that is required in order for the product/service to even be considered by a customer.
An order winner is a characteristic that will win the bid or customer's purchase.

(10 marks, 6+4)

4(b) (i) Using a break-even graph, or otherwise, calculate the BEQ.



BEQ = Fixed Costs/ (Import cost– variable costs) = **30,000 / 40 - 20 = 1500**

(ii) Determine whether it is more cost effective for the electronic toy to be imported or manufactured in Ireland.
It is more cost effective for the electronic toy to be manufactured in Ireland.

(iii) Calculate the profit earned on 20,000 units by importing and re-packaging the toy and the profit earned on 20,000 units manufactured in Ireland.

Selling Price = **20,000 x €50= €1,000,000**
Import cost= **20,000 × €40 = €800,000**
Manufacture cost = **20,000 × €20 = €400,000 + €30,000** (machinery/tooling) **= €430,000**

Import profit = **€1,000,000 - €800,000 = €200,000**
Manufactured profit = **€1,000,000 - €430,000 = €570,000**

(16 marks, 8+4+4)

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

4(c) (i) Describe **each** of the four stages of the Deming Cycle.

Plan - **the current situation is analysed, data gathered and solutions suggested.**
Do - **the suggested solution is tested or piloted**
Study/Check - **the trial solution is examined critically highlighting problems and opportunities**
Act - **the solution is implemented and adopted as standard procedure, etc.**

(ii) Describe **any two** of the following strategies:

Just-in-Time Manufacturing (JIT): **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.**

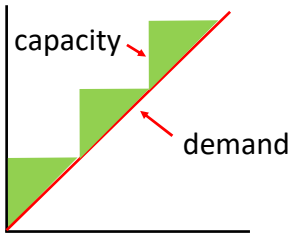
Lean production: **an approach to management that focuses on cutting out waste, whilst ensuring quality. This approach can be applied to all aspects of a business – from design, through production to distribution.**

Total Quality Management (TQM): **The continual process of detecting and reducing or eliminating errors in manufacturing, streamlining supply chain management, improving the customer experience and ensuring that employees are up to speed with training. Total quality management aims to hold all parties involved in the production process accountable for the overall quality of the final product or service.**

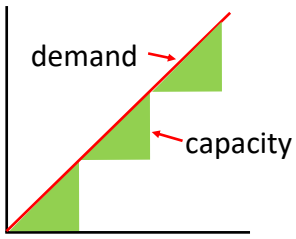
(14 marks, 8+6)

OR

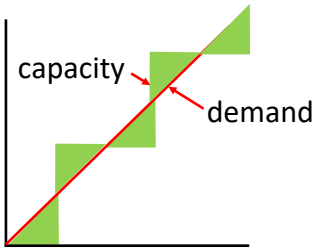
4(d) (i) **Capacity lead strategy**



Capacity lag strategy



Average capacity strategy



Capacity lead strategy **always sufficient capacity to meet demand and any growth, improving infrastructure (shops) in anticipation of potential new customers from competitors, etc.**

Capacity lag strategy **adding capacity after demand growth, e.g., order placed for new cars.**

Average capacity strategy **trying to maintain capacity and meet short-term surges in demand, toys for sale in shops at Christmas, etc.**

(ii) The consequences of creating excess capacity:
Cost of storage or disposal of unused product, cost of manufacturing, loss in profit due to products going beyond their shelf life, reduced selling price, etc.

The consequences of not being able to meet demand:
Loss of market share, reduced profits, reputational damage, etc.

(14 marks, 8+6)

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

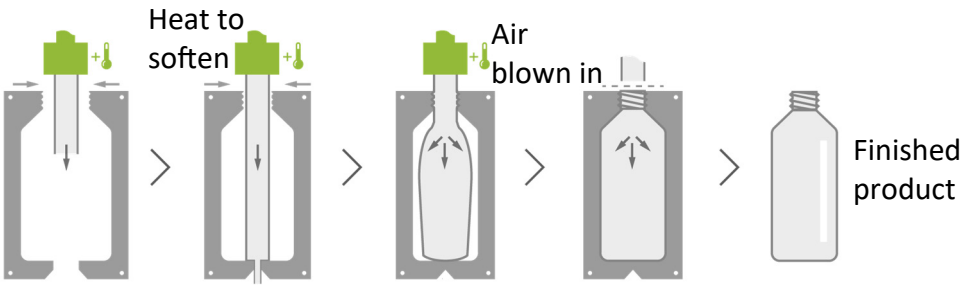
(a) - 10 marks, (b) - 16 marks, (c) OR (d) - 14 marks

5(a) (i) Explain the abbreviation PET.
Polyethylene terephthalate, commonly known as polyester and is the most commonly used thermoplasic polymer.

(ii) Outline **three** disadvantages of the extensive use of PET bottles.
Use of oil and chemicals in production, non– biodegradable, damage the environment and ecosystems, etc.

(10 marks, 4+6)

5(b) (i) Blow moulding:



(ii) Outline **one** way in which plastic bottles are designed to maximise their strength.
Plastic bottles are formed with thin walls which are stiffened by design through corrugated grooves, the base of plastic bottles are thicker than the walls for stability, contents exert pressure on thin walls to minimise collapse, etc.

(iii) Explain, with examples, each of the following plastic manufacturing techniques:

Mass production: **large scale manufacturing/ continuous production, e.g. canned food, cars, etc.**
Batch production: **Small quantities or specialised products, e.g., baked goods, jewellery, etc.**

(16 marks, 8+4+4)

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

5(c) (i) Identify specific safety precautions to be observed in **each** of the following uses of adhesives.
Epoxy resins: **use in ventilated area, catalyst needs to be handled carefully, metals to be joined need to be held securely while curing, etc.**
Cyanoacrylates: **rapid bonding, avoid skin contact, wear gloves, be aware of fumes, etc.**

(ii) Outline **two** safety features that are integrated into the design of a bandsaw.
Cutting blade is guarded, cut-off switches prevent the machine operating until housing is closed, blades are tensioned for efficient operation, emergency stop buttons at waist or foot level, etc.

(14 marks, 8+6)

OR

5(d) (i) Suggest **two** reasons for the use of tubular metal in the Petite Coiffeuse dressing table designed by Eileen Gray.
Tubular steel is light yet structurally strong, it can be chrome-plated for a shiny finish, can be welded, can be fabricated into curved shapes, etc.

(ii) Describe, with annotated sketches, a process to produce a smooth and durable surface finish on the ash table.

Polyurethane varnish produces a hard, durable surface finish on the table.
The table is lightly sanded and dust is removed, blemishes may be filled.
The surface is sealed with a light coat of polyurethane and sanded again.
The process is repeated after the first coat is completely dry.
The polyunethane can be applied by brush or spray.

(14 marks, 8+6)

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Leaving Certificate Examination, 2019

Technology

Coursework Briefs

Ordinary Level and Higher Level

200 marks

The Thematic Briefs for the Leaving Certificate Examination 2019 are given overleaf.

The Coursework must be available for assessment by Friday 29 March 2019.

Leaving Certificate Technology

Ordinary Level and Higher Level 2019

Instructions to candidates:

1. The coursework submitted for assessment must consist of two components:
   - a design folio *and*
   - an artefact.

2. If **either** assessment component (written examination or coursework) is submitted at Ordinary Level, the subject is graded at Ordinary Level.

3. All coursework submitted for assessment must be clearly identified with your examination number.

4. The coursework submitted for assessment must be **your own individual work** and must be completed in school under the supervision of the class teacher.

5. Your coursework must not be removed from the school setting under **any** circumstances as doing so may result in such coursework being considered invalid.

6. The design folio should record all stages of your work and should document how the artefact meets the stated thematic brief.

7. When using research sources, including the Internet, the sources **must be acknowledged**. Research material copied directly from the Internet or from other sources and presented as your own work will not receive any marks.

8. The coursework should display knowledge and skills developed through your study of the core and chosen options.

9. All important operating features of the artefact must be clearly visible and be easily accessible without dismantling.

10. Where an electrical supply is used to operate the artefact, it should be of low voltage output. Where specialised equipment is required, it must be set up by you, have clear operating instructions and be ready to use.

11. The coursework presented for assessment must be displayed in an attractive manner. Multimedia presentations, where submitted, must be of **maximum** 3 minutes duration, must be set up by the candidate and must be ready for viewing.

The coursework must be available for assessment by Friday 29 March 2019.

Leaving Certificate 2019 - Higher Level

Thematic Brief

Mens sana in corpore sano is a Latin phrase usually translated as "a healthy mind in a healthy body". It is widely used to highlight the positive relationship between physical and mental good health.
With regular studies and reports detailing increasing rates of mental and physical ailments experienced by many people of all ages, it is impossible to ignore the importance of fitness and wellbeing in our lives.

Technology can be used to promote physical and mental activity and to positively influence behaviour. For some time now, pedometers, accelerometers, and heart rate monitors have been used as training and motivational tools. Other technologies used to promote physical and mental engagement and activity include geographic information systems (GIS), global positioning systems (GPS), interactive video games, and 'persuasive technology'.

Some examples of areas where technologies are used in fitness and wellbeing include:

- Cardiovascular/Aerobic Conditioning
- Strength Training and Muscular Development
- Relaxation
- Education and awareness.

In this context and with a focus on modern materials and processes, design and manufacture a working model of a device, system or technological aid that would be of benefit in an area of fitness and/or wellbeing. Your solution should include an electro-mechanical element and should also be well presented.

Note: The maximum dimension of the artefact you present for assessment should not exceed 500 mm.
If multimedia presentations are used to enhance your display, a hardcopy printout and a digital file (USB flash drive) must be included in your portfolio.

Coursework at Higher Level is weighted as follows:

- Design Folio - 50% of marks
- Artefact - 50% of marks

Total - 200 marks

Design Folio - Higher Level - 100 marks			
No.	***Heading***	***Description***	***Marks***
1	Analysis of thematic brief	Evidence of research of the broader context of the theme. Specification of chosen parameters.	10
2	Overall management of the project	Analysis of available resources, time and budget constraints; proposed timeframe/Gantt chart, etc.	5
3	Environmental impact of the project	Demonstration of environmental awareness during **design and realisation**. Analysis of materials chosen for manufacture. Consideration of energy requirements, reuse/recycling etc.	10
4	Research, investigation and specifications of brief	Further research into chosen area. Analysis of existing solutions. A statement outlining the candidate's final brief and related specifications.	10
5	Design ideas and selection of optimum solution	Annotated **freehand** sketches **related to your design specification**, outlining three possible solutions. Optimum solution identified and justified.	15
6	Sketches and drawings for manufacture	Detailed annotated sketches and drawings including all elements/aspects of solution; circuit diagrams/flowcharts/models/prototypes/ dimensions/scale/assembly details.	15
7	Production planning	Materials and component list and costings; scheduling, work breakdown structure; Gantt charts, critical path diagrams.	10
8	Product realisation	Sequence of manufacture including photographic record.	10
9	Testing, evaluation and critical reflection	Testing against chosen brief. Evaluation of final artefact. Comparison of planned schedules and actual schedules. Suggested modifications with justification. Critical reflection on the entire process	10
10	Presentation and ICT	Correct sequence of presentation. Quality of material presented. ICT skills in production and presentation of folio.	5

Artefact - Higher Level - 100 marks			
No.	***Heading***	***Description***	***Marks***
1	Artefact meets theme and specifications	Solution presented fulfils the thematic brief and the specifications as identified by the candidate.	10
2	Originality and creativity	Originality and creativity in design, aesthetics and ergonomics. Creative and appropriate use of materials.	15
3	Production skills	Processing of materials. Assembly of materials. Range and depth of skills.	30
4	Functionality	Artefact works well. Appropriate/limited use of commercial components/solutions.	20
5	Quality and finish	High quality manufacture. Artefact well finished. Due regard for health and safety.	15
6	Presentation	Coursework well presented. Parts well integrated and labelled where appropriate.	10

Note: ***While the general headings and marks above will largely remain the same, breakdowns may vary depending on the actual brief for any given year.***

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