



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2024 Technology

Section B and Section C

Ordinary Level

Monday 24 June Afternoon 2:00 - 4:00

160 marks

Instructions

Section B 48 marks

Core - Long-answer questions.

Answer the **two** core questions presented.

Each question in Section B carries 24 marks.

Section C 40 marks

Options - Long-answer questions.

Answer **one** of the five optional questions presented.

Each question in Section C carries 40 marks.

THESE QUESTIONS ARE TO BE ANSWERED IN THE ANSWERBOOK ATTACHED TO **SECTION A**.

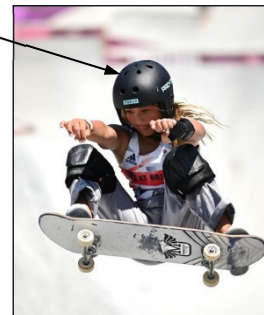
Section B - Core - Answer Question 2 **AND** Question 3

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

2(a) Skateboarding will be an Olympic sport in Paris 2024, and it will be compulsory for all competitors to wear a helmet.

- (i) Name the type of structure typically used in the manufacture of a helmet.
- (ii) Outline **one** other application for this type of structure.

Helmet



2(b) The underside of a skateboard is shown in the image below. The wheels are mounted to a truck using an axle and *ball bearing* systems. Each truck is attached to the deck and allows for some movement between the wheels and the deck.

- (i) Suggest a suitable plastic for the manufacture of the wheels. Justify your selection.
- (ii) Briefly outline the purpose of a ball bearing system in the wheel assembly.
- (iii) Describe, using notes and sketches, how the truck assembly could be attached to the deck of the skateboard.



Truck

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

2(c) Facial recognition will be used at the Paris Olympics to ensure a high level of security at each venue. It will be used by athletes, officials, staff, and the media.



- (i) Outline **one** advantage and **one** disadvantage of using facial recognition to control access to different venues.
- (ii) State **one** other *biometric* means that could be used to control access to an event.

OR

2(d) France has passed a bill to trial surveillance cameras based on artificial intelligence (AI) at the 2024 Olympic Games.

AI-powered camera systems will be used to identify suspicious behaviour in real time.

- (i) Outline **two** quality characteristics of the surveillance cameras.
- (ii) The law to trial AI-based surveillance has been controversial.
Outline **one** disadvantage of AI-based surveillance.



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

3(a) Jump Aero has unveiled the *JA1 Pulse*, a vertical take-off and landing aircraft. It is designed to respond to medical emergencies and has a top speed of 463km/h.



- (i) Outline **two** advantages of using the JA1 Pulse aircraft to respond to a medical emergency.
- (ii) Suggest a suitable material for the fuselage (body) of the aircraft. Justify your selection.

3(b) Jump Aero anticipates that their flying *prototype* will be completed in 2025. It will include multiple safety features in its design.

- (i) Explain what is meant by the term *prototype*.
- (ii) Suggest **two** safety features that could be incorporated into the design of the JA1 pulse.
- (iii) A student has decided to make a model of a similar aircraft to include two DC motors and two LEDs.

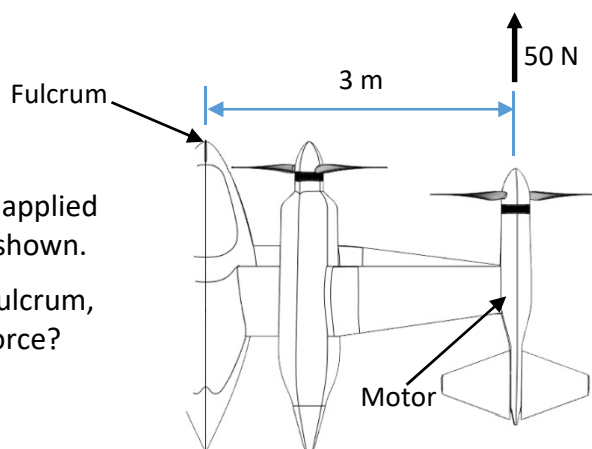
Draw a labelled diagram of a suitable electronic circuit for the model aircraft.



Answer 3(c) or 3(d)

3(c) The diagram shows a wing of the JA1 aircraft.

- (i) Calculate the moment when a force of 50 N is applied at a distance of 3 metres from the fulcrum as shown.
- (ii) If the motor is moved further away from the fulcrum, what effect would this have on the moment force?



OR

3(d) A Work Breakdown Structure (WBS) can be a useful tool when planning for the manufacture of a product.

- (i) Briefly outline **two** benefits of using a WBS when planning for the design and manufacture of a product.
- (ii) Suggest a sequence of steps to 3D print a propeller for a model aircraft.

Section C - Options - Answer **any one** of the five optional questions.

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

1(a) The image shows an automated bubble blower. Toys like this often use *Peripheral Interface Controllers* (PICs).

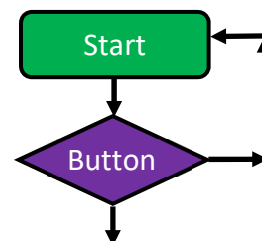


- (i) Outline **two** advantages of using a PIC in a child's toy.
- (ii) Suggest **one** other child's toy that could use a PIC and outline why it would be useful to use a PIC in this toy.

1(b) A PIC, like the one mentioned in **1(a)** above, is programmed using a flowchart.

- (i) Complete a flowchart to operate the bubble blower in the following sequence:

- When a button is pressed, the motorised blower is turned on
- When the button is pressed a second time, the motorised blower increases its speed
- When the button is pressed a third time, the motorised blower stops.



- (ii) Suggest a modification of the flowchart to alert the user when the bubble solution is running low.
- (iii) Name a suitable sensor that could be used to detect when the bubble solution is low.

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

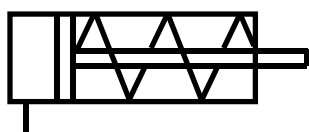
1(c) The image shows a Dippius S600 robotic vacuum cleaner and its charging unit. It is an example of a home automation system that is becoming increasingly popular.



- (i) Outline **two** advantages of using home automation systems.
- (ii) Give **one** other example of a home automation device.

OR

1(d) The graphic shows the pneumatic symbol for a single-acting cylinder (actuator).



- (i) Explain how a single-acting cylinder works with reference to the graphic shown.
- (ii) Give **one** practical example of where a single-acting cylinder could be used in everyday life.

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

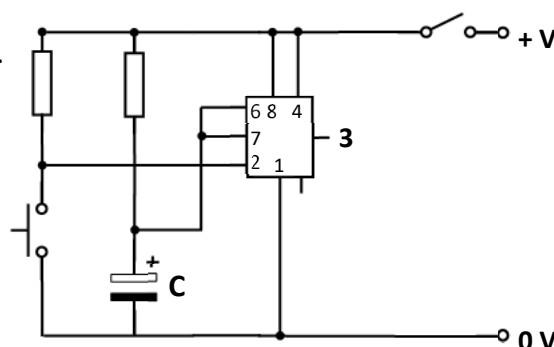
2(a) The image shows an LED. LEDs are *polarised* components widely used in electronic devices.



- (i) Explain what is meant by the term polarised.
- (ii) Describe how a student would ensure that an LED is correctly polarised when inserting it into a circuit.

2(b) Part of a 555 monostable IC is shown in the diagram.

- (i) Explain what is meant by the abbreviation IC.
- (ii) Briefly outline the purpose of capacitor C in the circuit.
- (iii) Redraw the circuit to include an LED output at pin 3 of the 555 IC.



Answer 2(c) or 2(d)

2(c) A student intends to drill 1 mm holes in a PCB to receive a resistor for soldering.

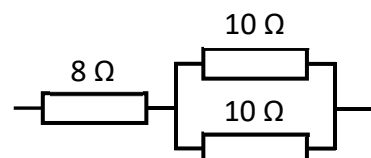


- (i) Explain what is meant by the abbreviation PCB.
- (ii) In **each** case, when drilling and when soldering, describe **one** safety precaution that must be observed by the student.

OR

2(d) A resistor with a gold band indicates that it has a *tolerance* of 5%.

- (i) Briefly outline what is meant by the term tolerance when referring to resistors.
- (ii) Calculate the total resistance for the partial circuit shown.



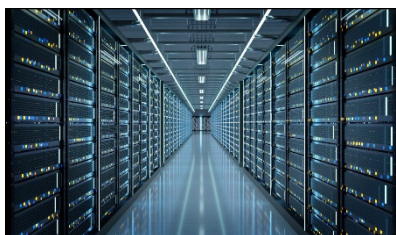
Option 3 - Information and Communications Technology - Answer 3(a) and 3(b)

3(a) A virtual reality (VR) headset, like the one shown opposite, covers the eyes completely for an immersive 3D experience.

- (i) Suggest **two** benefits of using a VR headset.
- (ii) Outline the difference between virtual reality and augmented reality.



3(b) Ireland has a high number of data centres which use large amounts of electricity. The hardware equipment used in data centres includes *routers, switches, modems, and firewalls*.



- (i) Outline **two** reasons why data centres use large amounts of electricity.
- (ii) Describe the main function of **any two** items of hardware listed above.
- (iii) Suggest **one** way in which the hardware could be kept cool in a data centre.

Answer 3(c) or 3(d)

3(c) *Social engineering* is the manipulation of someone to extract their personal information.

- (i) Outline **two** examples of social engineering.
- (ii) Describe **two** measures that can be taken by individuals to avoid social engineering.



OR

3(d) Software installed on personal computers often needs to be licenced before use.

- (i) State a reason why a user might need to purchase a licence for a particular software application.
- (ii) Outline the difference between *software* and *hardware* when referring to computers.



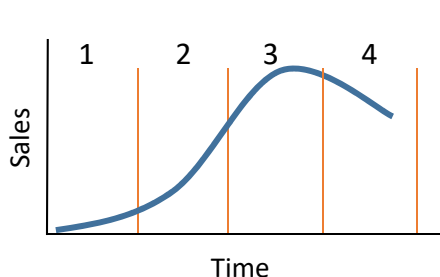
Option 4 - Manufacturing Systems - Answer 4(a) and 4(b)

4(a) Reverse engineering is the process of deconstructing or dismantling a product to learn how it works. It can also tell you more about the product's design.

- (i) Suggest **two** reasons why a company might use this technique when designing a product.
- (ii) Many people feel that this technique should not be allowed. Outline **one** objection people might have to reverse engineering.



4(b) The graph shows a projected lifecycle for a hair dryer. It tracks the sales of a company's product over a four-year period.



- (i) Give **two** reasons why the sales are low in year 1.
- (ii) Briefly outline **two** challenges for the company in meeting the demand for the product in Year 2.
- (iii) Describe **two** techniques the company could use to increase its sales as the demand for the product declines during year 4.

Answer 4(c) or 4(d)

4(c) *Planned obsolescence* describes the practice of designing products to break quickly or become obsolete in the short to medium-term.

- (i) Briefly describe **two** problems of planned obsolescence for a consumer.
- (ii) Suggest **two** benefits of planned obsolescence for the manufacturer of a product.

OR

4(d) When setting up a manufacturing company, it is essential to have good leaders and people who work well as a team.

- (i) Describe **two** characteristics of a good team leader.
- (ii) Suggest **two** reasons why it is important to have people who work well as a team.



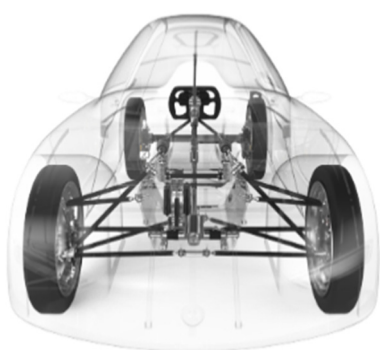
Option 5 – Materials Technology – Answer 5(a) and 5(b)

5(a) TUfast Eco, designed by students at the Technical University of München, has become the electric vehicle with the longest range in the world. The shell of the car is made from carbon fibre *composite* material.

- (i) Explain what is meant by the term composite, when referring to materials.
- (ii) Name **one** other composite material and outline **one** advantage of using this material.



5(b) Metal tubing is used in the manufacture of the suspension system of the electric vehicle.



- (i) Briefly outline **two** reasons for the use of metal tubing in manufacturing the suspension system.
- (ii) Describe a suitable finish that could be applied to protect the metal tubing from degradation.
- (iii) The metal tubes are joined using *permanent* jointing methods while the shell is attached to the suspension using *semi-permanent* joints. Explain what is meant by both permanent and semi-permanent joints, giving an example of each.

Answer 5(c) or 5(d)

5(c) A steering wheel, like the one shown opposite, is to be manufactured for the above vehicle.

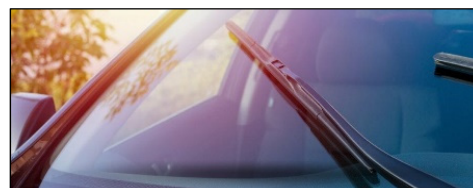
- (i) Name a suitable plastic that could be used when manufacturing the steering wheel. Justify your selection.
- (ii) Outline **two** problems for the environment caused by using plastics to manufacture products.



OR

5(d) The image shows a vehicle windscreen which is made from a photochromic *smart material*. It automatically darkens in sunlight making it easier for the driver to see out.

- (i) Explain what is meant by the term smart material.
- (ii) Suggest **one** other application for a photochromic material.



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Acknowledgements

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- Image 2 page 2: <https://www.independent.co.uk/sport/olympics/paris-2024-olympics-new-sports-b1896547.html>
- Image 3 page 2: <https://nypost.com/2018/08/07/tokyo-to-use-facial-recognition-technology-for-2020-olympics/>
- Image 4 page 2: <https://eandt.theiet.org/content/articles/2023/03/france-to-trial-ai-surveillance-technology-at-2024-olympic-games-despite-concerns/>
- Image 1 page 3: <https://evtol.news/jump-aero/>
- Image 2 page 3: <https://www.meesho.com/electronic-spices-pair-of-4-10x12x20-mm-55-mm-mini-drone-dc-motor-propeller-25000-rpm-dual-shaft-motor-mini-drone-spares-and-diy-projects-motor-control-electronic-hobby-kit/p/4bafr0>
- Image 3 page 3: <https://evtol.news/jump-aero/>
- Image 1 page 4: <https://www.amazon.com/ONE-Automatic-Portable-Toddlers-Batteries/dp/B072J1GX6M?th=1>
- Image 2 page 4: <https://www.amazon.com/DIPIUS-Cleaner-Collect-Station-Navigation/dp/B0BZXQLZWG>
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- Image 2 page 5: <https://www.wellpcb.com/standard-pcb-drill-sizes.html>
- Image 3 page 5: <https://www.diyelectronics.co.za/store/resistors/1576-resistor-330-ohm-14w-5.html>
- Image 1 page 6: https://encrypted-tbn0.gstatic.com/images?q=tbn:AND9GcTpjX6qunNUL0rITp2PdTJQeCWufCw1pmM87J0yVRuc1kEUFIObkW1s4stZ_B0h3QgzF6E&usqp=CAU
- Image 2 page 6: <https://www.tomshardware.com/reviews/cpu-socket-definition,5758.html>
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