



Coimisiún na Scrúduithe Stáit State Examinations Commission

LEAVING CERTIFICATE EXAMINATION, 2021

ENGINEERING – MATERIALS AND TECHNOLOGY

(Ordinary level – 150 marks)

THURSDAY 10 JUNE

MORNING 9:30 – 12:00

Answer any THREE questions.

All questions carry equal marks.

The 2021 examination papers were adjusted to compensate for disruptions to learning due to COVID-19. This examination paper does not necessarily reflect the same structure and format as the examination papers of past or subsequent years.

Question 1.

(50 marks)

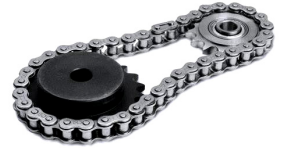
Give **brief** answers to **any eight** of the following:

- (a) Give **two** examples where Personal Protective Equipment (PPE) must be worn in the Engineering room.



- (b) Explain the engineering term *permanent joint*.

- (c) State **one** application of the chain and sprocket mechanism shown.



chain and sprocket

- (d) Name **two** forms of renewable energy.

- (e) Identify tool **A** shown opposite **and** give **one** use for this tool.

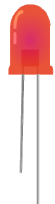


tool A

- (f) State **one** example of a *ferrous metal* **and one** example of a *non-ferrous metal*.

- (g) State **one** contribution engineering makes to the transport industry.

- (h) Name the electronic component shown **and** suggest **one** suitable application of this component.

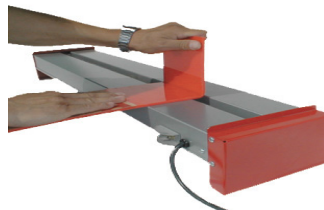


electronic component

- (i) Describe the main operating features of **any one** of the following:



Air compressor



Strip heater



Three-jaw chuck.

- (j) Describe **any one** of the following:

Laser cutting,

Bluetooth,

Drone.

- (k) Define the term *brittleness* in relation to the properties of materials **and** name **one** material which is brittle.

- (l) Explain **any one** of the following:

Pilot hole,

Countersink bit,

Swarf.

- (m) Name component **B** shown **and** state its function.

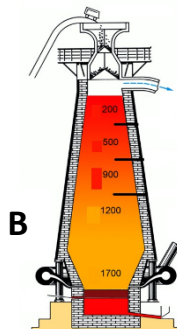
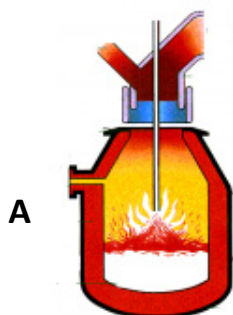


component B

Question 2.

(50 marks)

- (a) Name **and** state the function of **each** of the following furnaces, labelled **A**, **B** and **C**.



- (b) Select **one** of the furnaces shown at **Q2(a)** above **and**, with the aid of a suitable diagram, answer **each** of the following:

- (i) Label the main parts of the furnace;
- (ii) List the materials used in the charge;
- (iii) Describe how the charge is heated.

- (c) You have been asked to manufacture a wheelchair, as shown, which is suitable for use in a basketball game.

- (i) Name a suitable material for **each** of the parts labelled on the wheelchair.
- (ii) State **one** reason for the selection of **each** material.



- (d) Name the metals used to produce **any two** of the alloys listed below:



(i) Solder,



(ii) Bronze,



(iii) Brass.

Question 3.

(50 marks)

(a) Explain **any two** of the following processes:

- (i)** Quenching, **(ii)** Case hardening, **(iii)** Annealing, **(iv)** Work hardening.

(b) Describe **how** to carry out **each** of the following heat treatment processes:

(i) To *harden* the point of a centre punch.



(ii) To *temper* the cutting edge of a cold chisel.



(c) State **two** safety precautions to be observed during the heat treatment of metals.

(d) Explain **any two** of the following terms:

- (i)** Malleability, **(ii)** Compressive strength, **(iii)** Ductility, **(iv)** Tensile strength.

OR

(d) **(i)** State **two** advantages of robotics in manufacturing.

(ii) State **two** ways in which the use of robotic technology can improve the safety of a work environment.



Question 4.

(50 marks)

- (a) (i) Name the type of flame produced for **each** of the following oxy-acetylene gas conditions:
- Excess acetylene
 - Excess oxygen
 - An equal balance between oxygen and acetylene.

- (ii) Describe **two** steps necessary to ensure a successful soft soldered joint.



- (b) Answer **any three** of the following in relation to **manual metal arc welding**:

- (i) Why is a *flux* required on the electrode during manual metal arc welding?
- (ii) What is the function of the welding earth clamp shown?
- (iii) Describe **one** function of slag.
- (iv) State **two** safety precautions to be observed when manual metal arc welding.



welding earth clamp

- (c) Answer **any three** of the following:

- (i) Name tool **B** shown **and** state the purpose of tool **B**.
- (ii) Explain the difference between a plug tap and a tapered tap.
- (iii) Name **one** suitable method used to join light gauge sheet aluminum.
- (iv) State **any two** advantages of using spot welding.



tool B

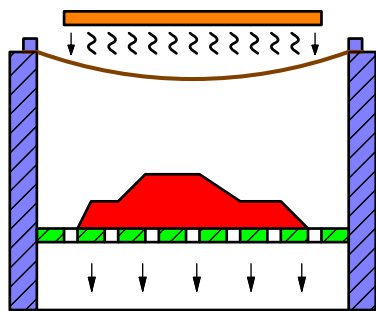


- (d) State **two** safety precautions to be observed when using an electrical soldering iron.

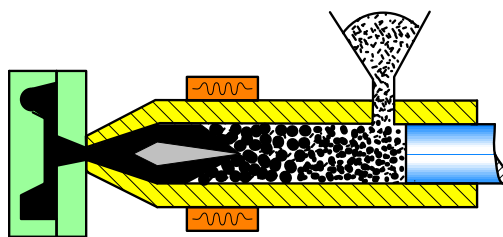


Question 5.

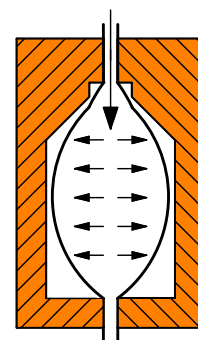
(50 marks)



A



B



C

- (a) (i) Name **any two** of the plastic manufacturing processes shown at A, B and C.
- (ii) Describe, with the aid of a diagram, **any one** of the manufacturing processes named by you at Q5(a)(i) above.
- (b) In relation to plastic technology, answer **any two** of the following:
- (i) Name the **type** of plastic which softens when heated.
- (ii) Explain the term *elastic memory*.
- (iii) Name the **type** of plastic which remains hard after being heated.
- (c) Select **any two** of the household items shown below **and** name a plastic material which is suitable to produce **each**:



(i) Basin



(ii) Toothbrush



(iii) Shampoo bottle.

- (d) State **two** safety precautions to be observed when using an adhesive to bond acrylic.



Question 6.

(50 marks)

- (a) Identify **any three** of the lathe parts shown.



(i)



(ii)



(iii)



(iv)

- (b) Describe **any three** of the following in relation to machining:

(i) Cutting fluids,

(ii) Clearance angle,

(iii) Chuck key,

(iv) Depth of cut.

- (c) A cutting tool used on a centre lathe is shown.

(i) Name the cutting tool shown.

(ii) Describe the function of the cutting tool shown.

(iii) State **two** safety precautions that should be observed when using the cutting tool shown.



OR

- (c) Identify **any three** safety features of a Computer Numerical Control (CNC) lathe.



Question 7.

(50 marks)

- (a) (i) Name **two** types of fit possible when assembling a shaft and a hole.
- (ii) Describe **any one** of the fits named at Q7(a)(i).

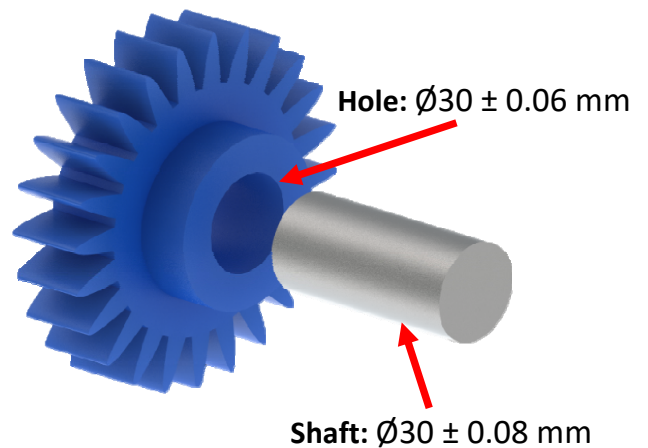
- (b) A hole and shaft assembly is manufactured to the dimensions shown.

State the: (i) Nominal diameter of the hole;

(ii) Largest diameter of the shaft;

(iii) Smallest diameter of the hole;

(iv) The type of fit which will result from the assembly of the largest shaft and the smallest hole.



- (c) Name **any three** of the instruments shown and give **one** application of **each** instrument named:



(i)



(ii)



(iii)



(iv)

OR

- (c) (i) Name **any two** electronic components that could be used in the electrical drive of the model eRacer shown opposite.
- (ii) Draw the electronic symbol for **each** electronic component named.

