B 3 2

Pre-Leaving Certificate Examination, 2024

ENGINEERING – MATERIALS AND TECHNOLOGY

(Ordinary Level — 200 marks)

TIME: 2½ HOURS

Answer any **FOUR** questions.

All questions carry equal marks.

Question 1. **(50 marks)**

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

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

(b) State **two** properties associated with copper.

(c) Explain the term *non-ferrous metal*.

(d) Identify the mechanism shown opposite and give **one** appropriate use for it.

(e) Name the alloy which is produced from lead and tin.

(f) State **two** uses of a USB cable.

(g) Give **one** benefit of using computer aided drawing (CAD) in Engineering.

(h) Is a wind turbine a renewable energy source or a non-renewable energy source?

(i) Describe, with reference to the images below, the main operating features of any **one** of the following:

(i) Hot wire strip heater,

(ii) Pop rivet gun,

(iii) Air compressor.

(j) Explain **any one** of the following:

(i) Virtual reality, **(ii)** Bluetooth, **(iii)** Micro:bit.

(k) Define the term *electrical insulator* in relation to the properties of materials and name **one** material which is a good electrical insulator.

(l) Describe **any one** of the following:

(i) Blind hole, **(ii)** Reamer, **(iii)** Swarf.

(m) Name the cutting tool shown and state its function.

Question 2. **(50 marks)**

(a) In relation to metal production, explain **any three** of the following furnace terms:

(i) Charge, **(ii)** Carbon electrode, **(iii)** Refractory lining, **(iv)** Oxygen lance.

(b) Describe, with the aid of a labelled diagram, the operation of **one** furnace you have studied.

(c) You have been asked to manufacture an electric drift kart, as shown, which is suitable for use in a carpark or warehouse.

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

(d) Select **any two** of the following metals and state if they are ferrous or non-ferrous:

(i) Brass,

(ii) Aluminium,

(iii) Cast Iron.

Question 3. **(50 marks)**

(a) The blades of the garden shears are annealed, hardened, and tempered during manufacture. Describe **any two** of the following processes:

(i) Annealing,

(ii) Hardening,

(iii) Tempering.

(b) In relation to the heat treatment of steel, explain **any two** of the following:

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

(c) State **two** safety precautions to be observed when handling hot metals during heat treatment.

(d) Describe **any two** of the following material properties:

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

OR

(d) **(i)** State **two** engineering manufacturing processes where robots are used.

(ii) State **one** advantage and **one** disadvantage of the use of robotics in manufacturing.

Question 4. **(50 marks)**

(a) **(i)** Identify the **three** types of flame produced when gas welding.

(ii) Name the **two** gases most commonly used in gas welding.

(iii) State the colour of the cylinder and gas stored for **each**.

(b) Give **one** suitable use for **any three** of the following in relation to manual metal arc welding:

(i) Chipping hammer,

(ii) Earth clamp,

(iii) Welding mask,

(iv) Electrodes.

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

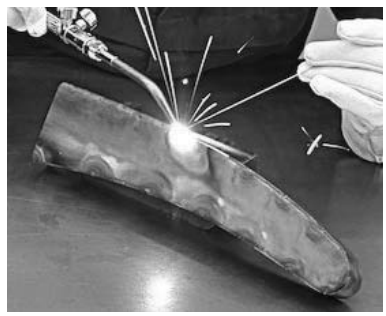
(i) State **two** advantages of using spot welding to join sheet steel.

(ii) Explain the difference between an M5 hole and a Ø5 hole.

(iii) Name a suitable method used to produce a permanent joint between electronic components.

(iv) Explain why it is important to work in a well-ventilated area when using adhesives.

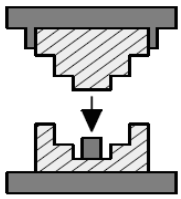
(d) State **two** safety precautions to be observed when gas welding.



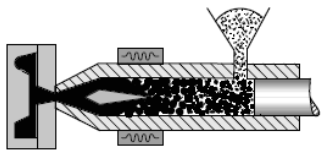
Question 5. **(50 marks)**

(a) **(i)** Name **any two** of the plastic manufacturing processes shown at **A, B** and **C.**

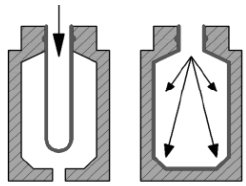
(ii) Describe, with the aid of a diagram, any **one** of the manufacturing processes named by you at **Q5(a)(i)** above.



A



B



C

(b) In relation to plastic technology, explain any **three** of the following:

(i) Thermoplastic;
(ii) Thermoforming;
(iii) Thermosetting plastic;
(iv) Elastic memory.

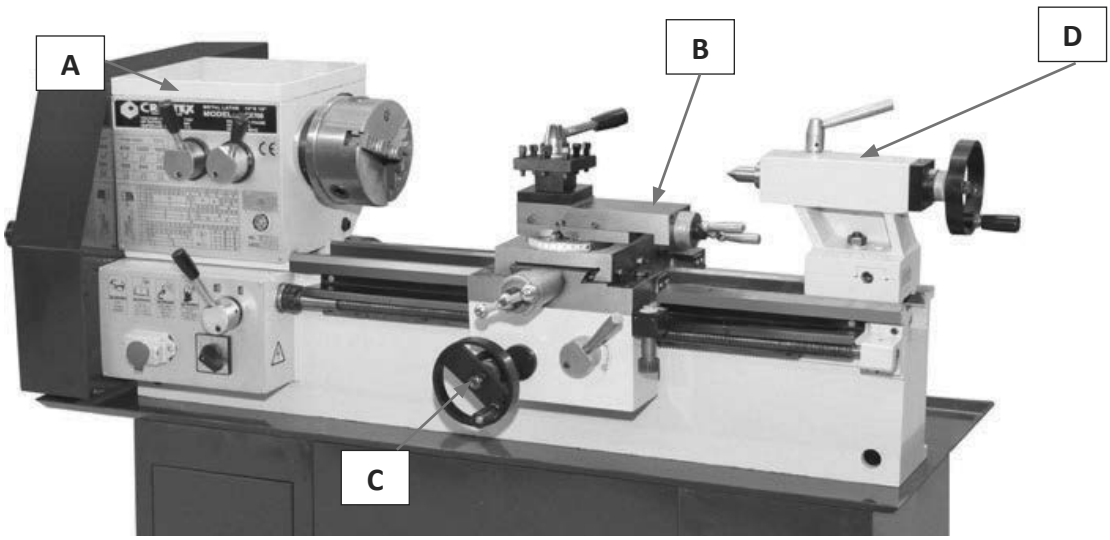
(c) Select any **two** of the items shown below and name a suitable plastic material which could be used to produce each:

(i) Plastic kettle, **(ii)** Garden hose pipe, **(iii)** File handle **(iv)** Kitchen countertop.

(d) State **two** safety precautions to be observed when plastic dip coating.

Question 6. **(50 marks)**

(a) Name **any three** of the labelled parts on the lathe below.



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

(i) Chuck key, **(ii)** Cutting speed, **(iii)** Depth of cut, **(iv)** Feed.

(c) A part of the centre lathe is shown opposite.

(i) Name the lathe part shown.

(ii) Describe the function of the lathe part shown.

(iii) State **two** safety precautions to be observed when using the lathe part shown.

OR

(c) Many copies of the car part shown below have to be machined.

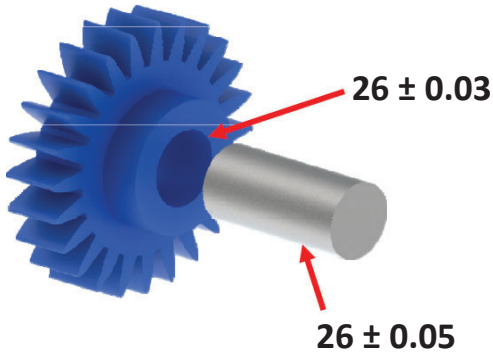
State **three** advantages of using a computer numerical control lathe (CNC lathe) rather than using a manual control lathe to produce these parts.

Question 7. **(50 marks)**

(a) Describe **any two** of the following terms in relation to limits and fits:

(i) Interference fit, **(ii)** Tolerance, **(iii)** Lower limit.

(b) A hole and shaft assembly are manufactured to the dimensions shown across.



State the:

(i) Nominal diameter of the **hole**.

(ii) Smallest diameter of the **hole**.

(iii) Largest diameter of the **shaft**.

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

(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 three** electronic components that could be used in the electrical system of the model airboat shown opposite.

(ii) Draw the electronic symbol for **each** electronic component named.