



**Coimisiún na Scrúduithe Stáit
State Examinations Commission**

LEAVING CERTIFICATE EXAMINATION, 2016

ENGINEERING – MATERIALS AND TECHNOLOGY

(Ordinary level – 200 marks)

THURSDAY, 9 JUNE

MORNING, 9:30 – 12:00

Answer **Question 1, Section A and Section B**, and **three** other questions.

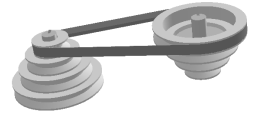
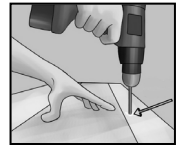
Question 1.

(65 marks)

SECTION A – 30 marks

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

- (a) List **two** safety precautions to be observed when drilling light gauge aluminium.
- (b) Name the alloy which is produced from lead and tin.
- (c) State a material which is a good electrical insulator.
- (d) Name the drive system shown and suggest **one** application for this system.
- (e) Outline **two** reasons why *planning* is essential in project work.
- (f) Describe **two** ways in which computer technology is used in the manufacturing process.
- (g) Name **one** type of thread form and suggest a suitable application for the thread form named.
- (h) State **two** reasons why *cutting fluids* are used when machining.



SECTION B – 35 marks

Answer **any three** of the following:

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



Worm and wheel mechanism



Tailstock



Vacuum forming machine.

- (j) Explain **any two** of the following:

Drone,

Hardware,

Virus,

High definition (HD).

- (k) Define the term *malleability* and name a material which is malleable.

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

Tensile force,

Countersink drill,

Thermal conductor,

Solar panel.

- (m) Name the machine component shown and explain its function.

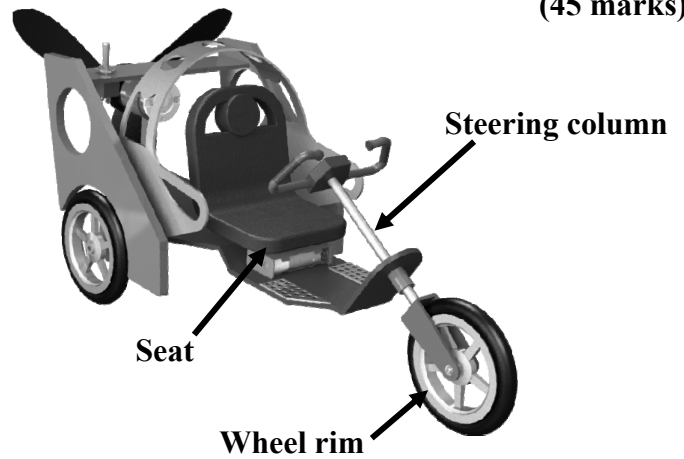


Question 2.

(45 marks)

(a) (i) Name a suitable material for **each** of the parts labelled on the trike buggy shown opposite.

(ii) State **one** reason for the selection of **each** material.



(b) For **each** of the metals listed below, name a suitable furnace used in the production of the metal:

(i) Steel

(ii) Pig iron

(iii) Cast iron.

(c) With the aid of a labelled diagram, describe the operation of **one** of the furnaces identified at 2(b) above.

(d) Name **two** ferrous metals and **two** non-ferrous metals.

Question 3.

(45 marks)

(a) (i) In relation to the properties of metals, explain the difference between hardening and annealing.

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

Hardening,

Annealing.

(b) For **each** of the following, select the *main* heat treatment process required during its manufacture:



(i) Scriber



(ii) Copper dish



(iii) Screwdriver point.

(c) State **two** safety precautions to be observed when using *coolants* during heat treatment.

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

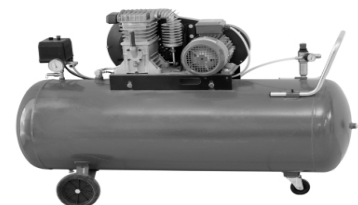
(i) Brittleness

(ii) Ductility

(iii) Toughness.

OR

(d) State **two** applications for a compressor in industry.



Question 4.

(45 marks)

(a) Describe **each** of the following oxy-acetylene flames:

- (i)** Neutral flame
- (ii)** Oxidising flame
- (iii)** Carburising flame.



(b) **(i)** State the function of **any three** of the following in manual metal arc welding:

Electrode, Welding mask, Arc, Generator.

(ii) List **three** steps to be observed to ensure a high quality joint in manual metal arc welding.



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

- (i)** Name the type of nut shown and suggest a suitable application for it.
- (ii)** Why is a passive flux required when soldering electrical circuits?
- (iii)** Outline **two** advantages for using spot welding to join metals.
- (iv)** What is the difference between a permanent joint and a temporary joint?



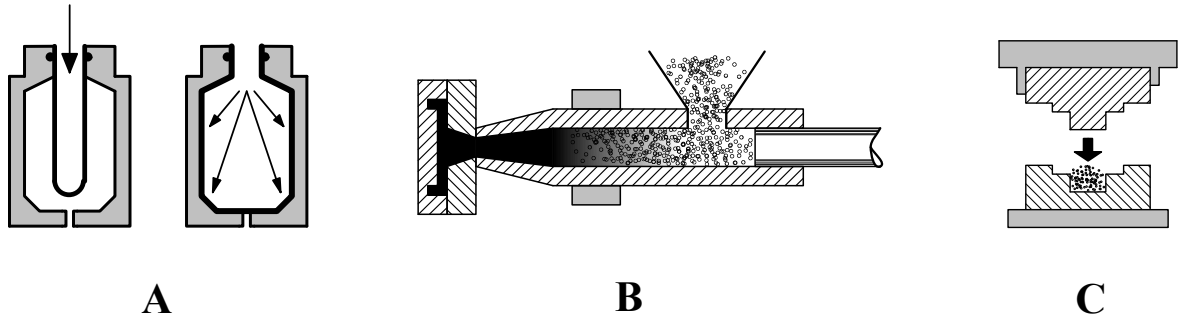
(d) State **two** safety precautions to be observed when using oxy-acetylene welding equipment.



Question 5.

(45 marks)

(a)



(i) Name the **three** plastic manufacturing processes shown at **A**, **B** and **C** above.

(ii) Describe with the aid of a diagram, **one** of the manufacturing processes named in **5(a)(i)** and identify **one** component produced by this process.

(b) State **two** safety precautions to be observed when using heat to form plastics.

(c) Identify a suitable plastic for the manufacture of **each** of the components shown below:



(i) Plastic water bottle



(ii) Plug casing.

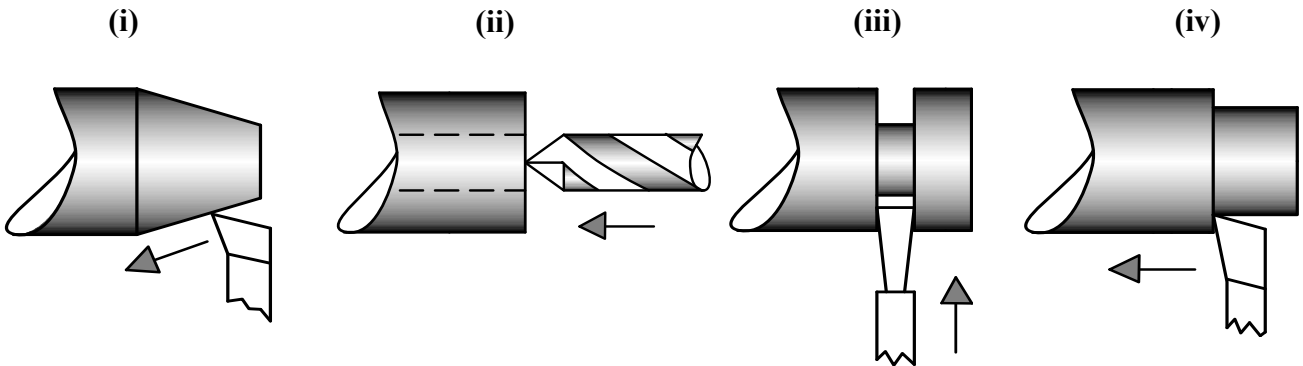
(d) (i) Which is more suitable for recycling, thermoplastic or thermosetting plastic?

(ii) Give **one** reason for your choice in **5(d)(i)** above.

Question 6.

(45 marks)

(a) Name **any three** of the lathe operations shown.



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

- (i) Four jaw chuck (ii) Clearance angle (iii) Pilot hole (iv) Swarf.

(c) A machining tool for a centre lathe is shown.



- (i) Name the process in which this machining tool is used.
(ii) Describe **two** things to be considered when setting up this machining tool.
(iii) State **one** safety precaution to be observed when using the machining tool shown.

OR

(c) State **three** advantages of operating a lathe by computer numerical control (CNC) rather than manual control.

Question 7.

(45 marks)

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

(i) Clearance fit

(ii) Upper limit

(iii) Transition fit.

(b) A steel shaft is machined to the dimensions shown.

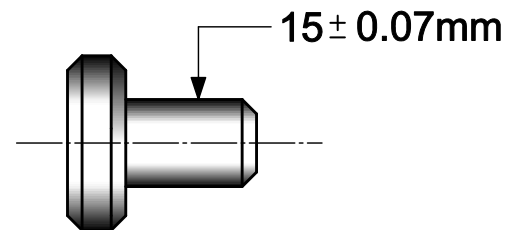
State the:

(i) Nominal diameter of the shaft;

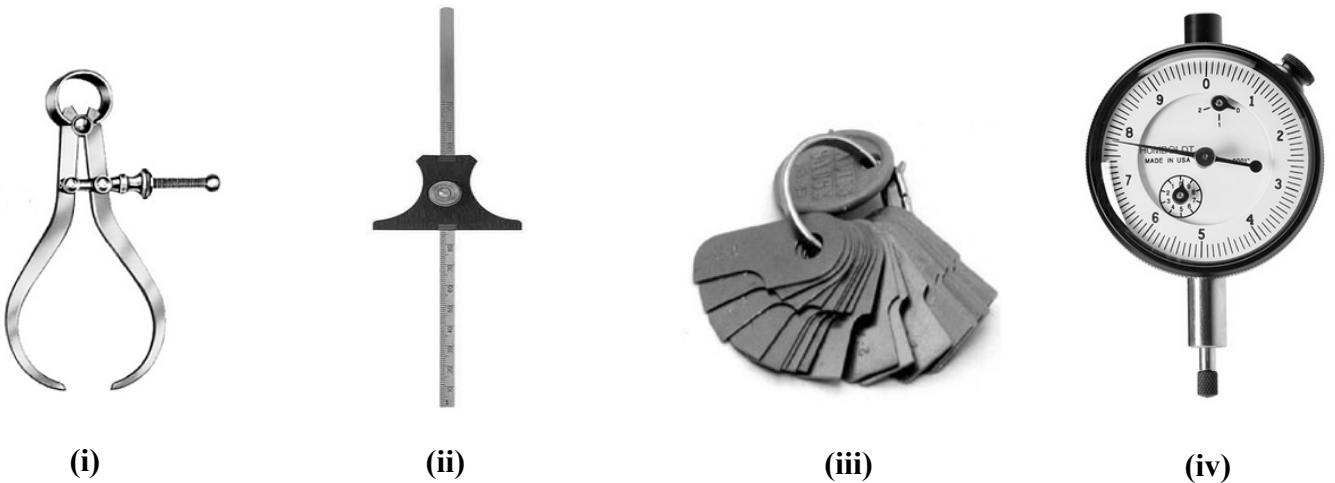
(ii) Minimum diameter of the shaft;

(iii) Maximum diameter of the shaft;

(iv) The tolerance on the shaft.



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



OR

(c) Name **each** of the electronic components shown below and outline the function of **each** component named.



(i)



(ii)



(iii)

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