# Coimisiún na Scrúduithe Stáit
# State Examinations Commission

## LEAVING CERTIFICATE EXAMINATION, 2017

## ENGINEERING – MATERIALS AND TECHNOLOGY

(Ordinary level – 200 marks)

THURSDAY, 8th 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 **any two** applications of drone technology.

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

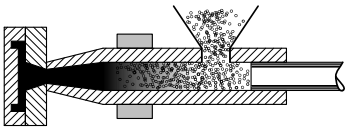
**(c)** The sun is a renewable energy source. Identify **one** non-renewable energy source.

**(d)** Name the machine tool shown and state **one** application for its use.

**(e)** Explain the term *clearance fit* in relation to a shaft and a hole.

**(f)** Name **two** computer output devices.

**(g)** Give **one** application for the *injection moulding* process.



**(h)** Identify **each** of the safety symbols shown.

**(i)** 

**(ii)** 

**SECTION B – 35 marks**

Answer **any three** of the following:

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

Hydraulic lifting platform

Ratchet and pawl mechanism

Scroll saw.

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

Bluetooth, 3-D printer, Cloud technology, GPS.

**(k)** Define the term *compressive strength* in relation to the properties of materials **and** give **one** application where a material needs to be strong in compression.

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

Carbon footprint, Self-locking nut, Pop riveting, Light emitting diode (LED).

**(m)** Name the mechanism shown and suggest **one** suitable application for it.

**Question 2.** **(45 marks)**

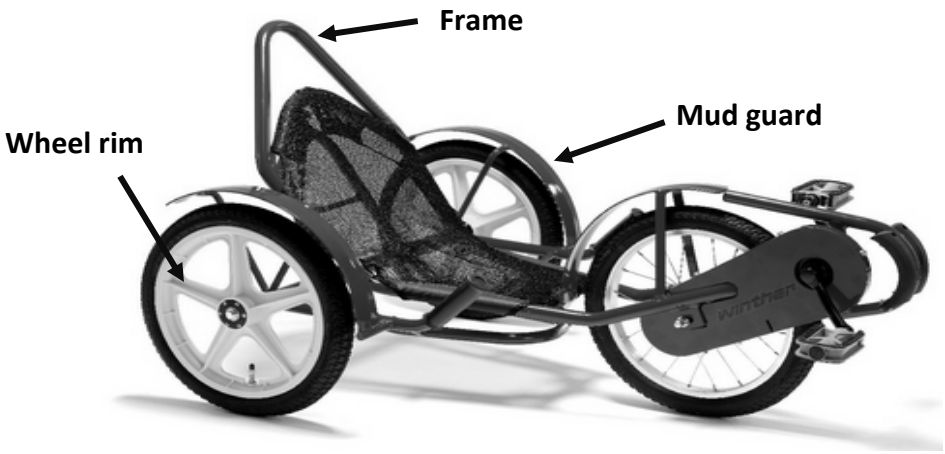
**(a)** **(i)** Name the metals produced from **each** of the furnaces listed below:

- Blast furnace
- Cupola furnace
- Electric arc furnace.

**(ii)** With the aid of a suitable diagram, describe the operation of **one** of the furnaces listed at **Q2(a)(i)** above.

**(b)** **(i)** Name a suitable material for **each** of the **three** parts labelled on the go-cart shown below.

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




**(c)** Name the *metal alloys* produced from **any two** of the following combinations:

**(i)** Copper and zinc;

**(ii)** Lead and tin;

**(iii)** Copper and tin.

**Question 3.** **(45 marks)**

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

**(i)** Case hardening;

**(ii)** Annealing.

**(b)** **(i)** Describe **how** the *point* of the centre punch shown is hardened and tempered.


**(ii)** Explain **why** it is necessary to *temper* the point of the centre punch shown.

**(c)** Identify **any two** items of protective clothing that should be worn when using *water* as a coolant during heat treatment.

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

**(i)** Malleability, **(ii)** Tensile strength, **(iii)** Work hardening.

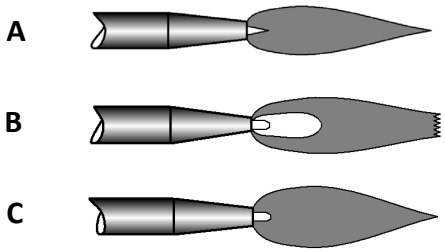
**OR**

**(d)** **(i)** State **one** advantage for the use of robotics in manufacturing.

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

**Question 4.** **(45 marks)**

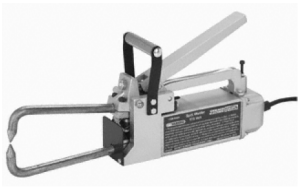
**(a)** **(i)** Name **each** of the oxy-acetylene flames shown at **A**, **B** and **C**.




**(ii)** State the proportions of oxygen and acetylene required for **each** of the flames shown at **A**, **B** and **C** above.

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

**(i)** Electric soldering iron, **(ii)** A sweated joint, **(iii)** Flux, **(iv)** Oxides.



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

**(i)** Describe the joining process which uses the welding machine shown.

**(ii)** Explain the term *tapping size hole.*

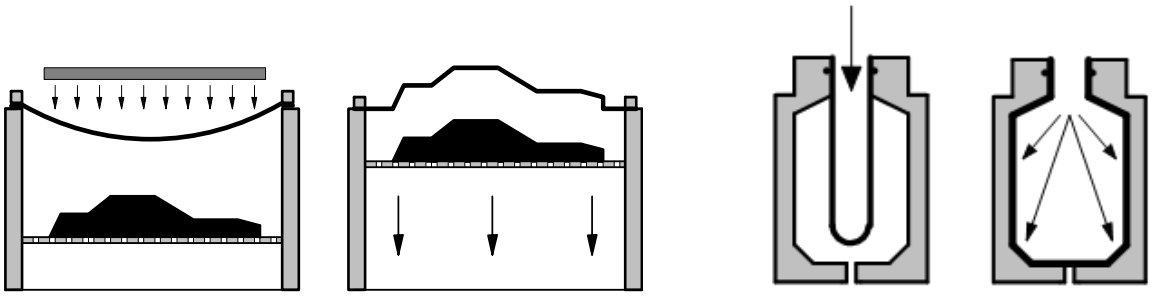
**(iii)** Describe the function of a *flashback arrestor* when using oxy-acetylene equipment.

**(iv)** State **two** safety precautions to be observed when using adhesives to join materials.

**(d)** State **two** reasons why it is important to wear goggles with a dark lens when gas welding.

**Question 5.** **(45 marks)**

**(a)** Two plastic manufacturing processes are shown at **A** and **B**.



**A** **B**

**(i)** Name the plastic manufacturing process shown at **A** **and** the plastic manufacturing process shown at **B**.

**(ii)** Outline the **main** differences between process **A** and process **B**.

**(iii)** For **each** process, identify a suitable component produced.

**(b)** Describe **any three** of the following terms associated with plastics:

**(i)** Thermoplastic;

**(ii)** Elastic memory;

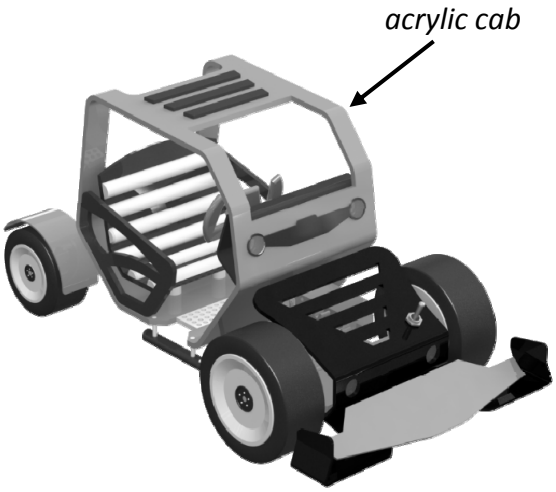
**(iii)** Thermosetting plastic;

**(iv)** Plastic dip coating tank.

**(c)** Identify a suitable application for **any two** of the following plastics:

**(i)** Polyethylene, **(ii)** Polystyrene, **(iii)** PVC.

**(d)** The cab of the car shown is made from acrylic. Describe a process which can be used to form the bends on the acrylic cab shown.



**Question 6.** **(45 marks)**

**(a)** **(i)** Give **one** reason for using cutting fluids when machining.

**(ii)** Give **one** reason for changing the speed of the chuck when machining on a centre lathe.

**(iii)** Give **one** reason why a lathe cutting tool must be positioned *on centre* before machining.

**(b)** Indentify **any three** of the lathe parts shown.

**(i)**

**(ii)**

**(iii)**

**(iv)**

**(c)** A chuck for use in a centre lathe is shown.

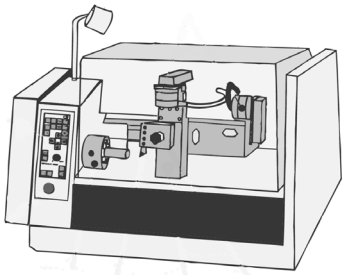
**(i)** Name this chuck.

**(ii)** Name **two** other methods for holding work on a centre lathe.

**(iii)** State **one** safety precaution to be observed when using this type of chuck.

**OR**

**(c)** A CNC lathe used for CAD/CAM technology is shown.



**(i)** What do the letters CAD/CAM stand for?

**(ii)** Describe **two** advantages of using CAD/CAM technology in industry.

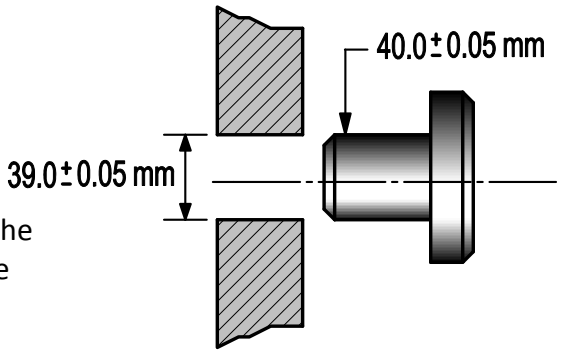
**(iii)** State **one** safety precaution to be observed when operating a CNC lathe.

**Question 7.** **(45 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 is manufactured to the dimensions shown.




State the: **(i)** Nominal diameter of the shaft;

**(ii)** Smallest diameter of the shaft;

**(iii)** Largest diameter of the hole;

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

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

**(i)**

**(ii)**

**(iii)**

**(iv)**

**OR**

**(c)** **(i)** Name **any three** of the electronic components labelled **A**, **B**, **C** or **D**.

**(ii)** State the function of **each** of the electronic components named.