Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE EXAMINATION, 2022

ENGINEERING – MATERIALS AND TECHNOLOGY

(Ordinary level – 150 marks)

_____

THURSDAY 9 JUNE MORNING 9:30 – 12:00

Answer **any THREE** questions.

All questions carry equal marks.

The 2022 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)**

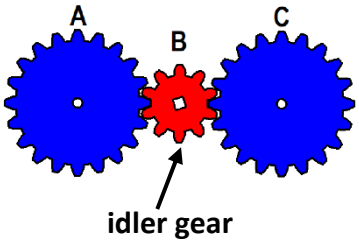
Give **brief** answers to **any eight** of the following:



(a) Give **two** safety precautions to be observed when using a pillar drilling machine.

(b) State **one** disadvantage of a *non-permanent joint* in metal.

(c) State **two** benefits of renewable energy.



(d) Explain the function of the idler gear **B** in the gear train shown.

(e) Give **one** reason why it is important to keep engine parts lubricated.

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

(g) Explain the term *non-ferrous* **and** name **one** *non-ferrous* metal.



(h) State **one** reason why *aluminium* may be used when manufacturing satellites for use in space.

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



Vacuum former,



Pop rivet gun,



Tin snips.

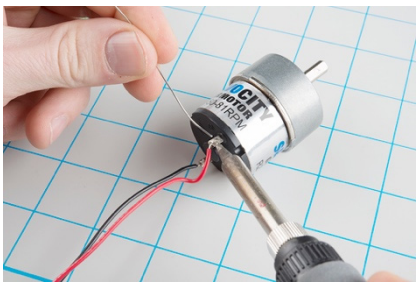
(j) Explain **any one** of the following:

Wireless control, Micro:bit, Sensor.

(k) Define the property *malleability* in metals **and** name **one** metal which is malleable.

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

Conductor, Engraving, Prototype.



(m) List **two** safety precautions to be followed when soldering electronic components.

Question 2. **(50 marks)**

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

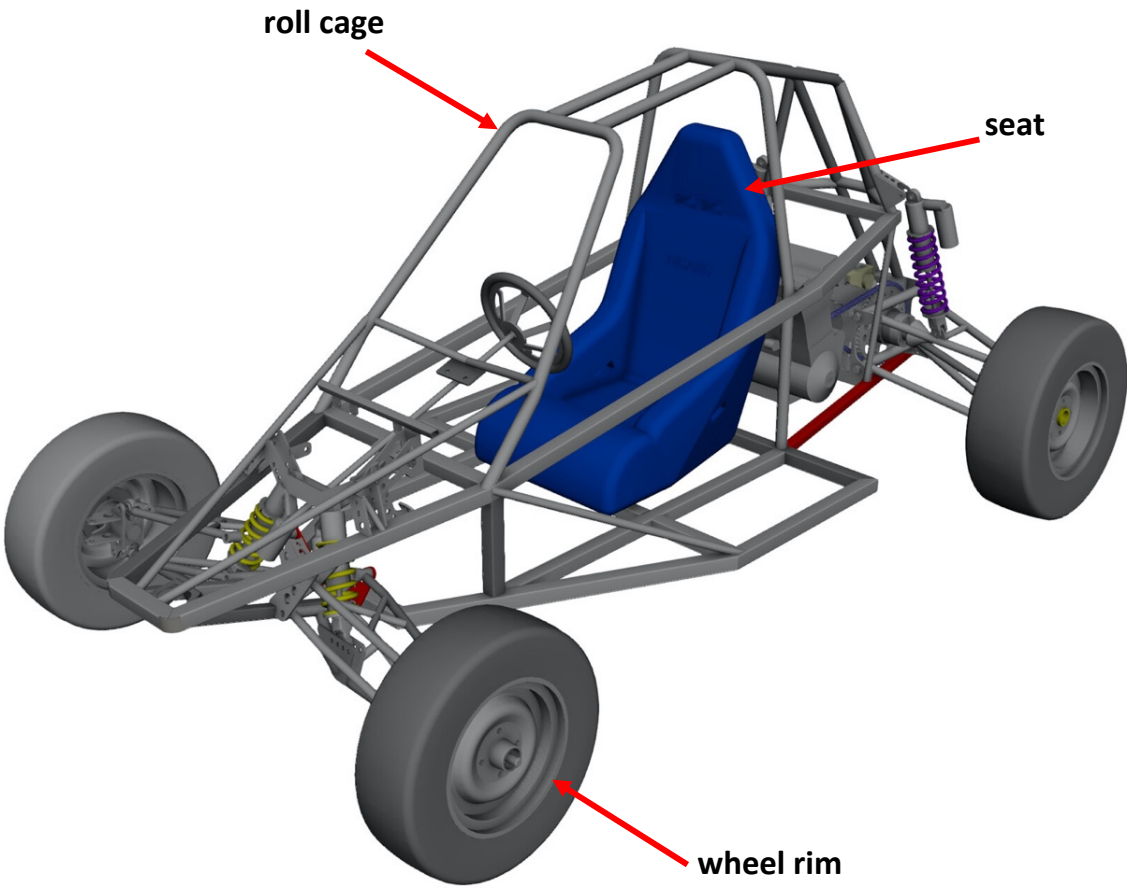
Tapping hole, Charge, Refractory lining, Slag.

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

(c) You have been asked to manufacture the off-road dune buggy shown below.

(i) Name a suitable material for **each** of the labelled parts on the off-road dune buggy.

(ii) State **one** reason for **each** material you have selected.



(d) As part of the drive system, the off-road dune buggy uses a *belt and pulley* mechanism, as shown.

(i) State **one** advantage of using a belt and pulley mechanism in a drive system.

(ii) State **one** disadvantage of using a belt and pulley mechanism in a drive system.



belt and pulley mechanism

Question 3. **(50 marks)**

(a) The head of a steel axe is annealed, normalised, and tempered during manufacture.



Describe **any two** of the following processes:

(i) Annealing;

(ii) Normalising;

(iii) Tempering.

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

(i) Quenching, **(ii)** Carbon content, **(iii)** Hardening temperature, **(iv)** Case hardening.

(c) State **any two** items of Personal Protective Equipment (*PPE*) that should be used by the person using the hand-held angle grinder shown in the picture.



(d) Explain **any two** of the following metal properties:

(i) Brittleness, **(ii)** Melting point, **(iii)** Toughness, **(iv)** Elasticity.

OR

(d) Give **one** example of the use of robotics in **any two** of the following:



(i) medicine;

(ii) gardening;

(iii) manufacturing.

Question 4. **(50 marks)**

(a) **(i)** Explain the function of part **A** and the function of part **B** for the oxy-acetylene torch shown.



(ii) Name **any two** flames which are produced when using an oxy-acetylene torch.

(iii) Explain the function of the gas regulator in oxy-acetylene welding.



(b) Describe the purpose of **any three** of the following in **manual metal arc welding**:



(i) Earth clamp,



(ii) Welding helmet,

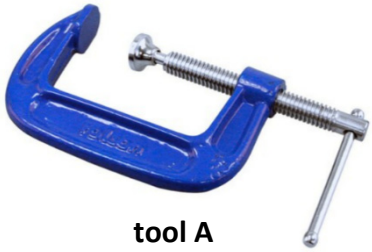


(iii) Electrode holder,



(iv) Welding curtain.

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



tool A

(i) Name tool **A** shown **and** give **one** use for this tool.

(ii) Explain why spot welding is **not** suitable for joining heavy gauge steel plate.

(iii) In relation to soldering, explain the term *sweated joint* **and** give **one** example where a sweated joint might be used.

(iv) Give **one** advantage of using thumb screws when assembling parts.

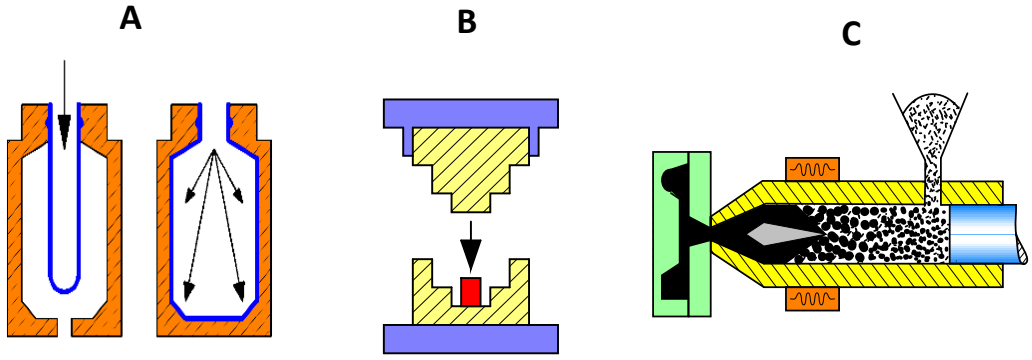


thumb screw

(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 labelled diagram, **any one** of the manufacturing processes named by you, at **5(a)(i)** above.

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

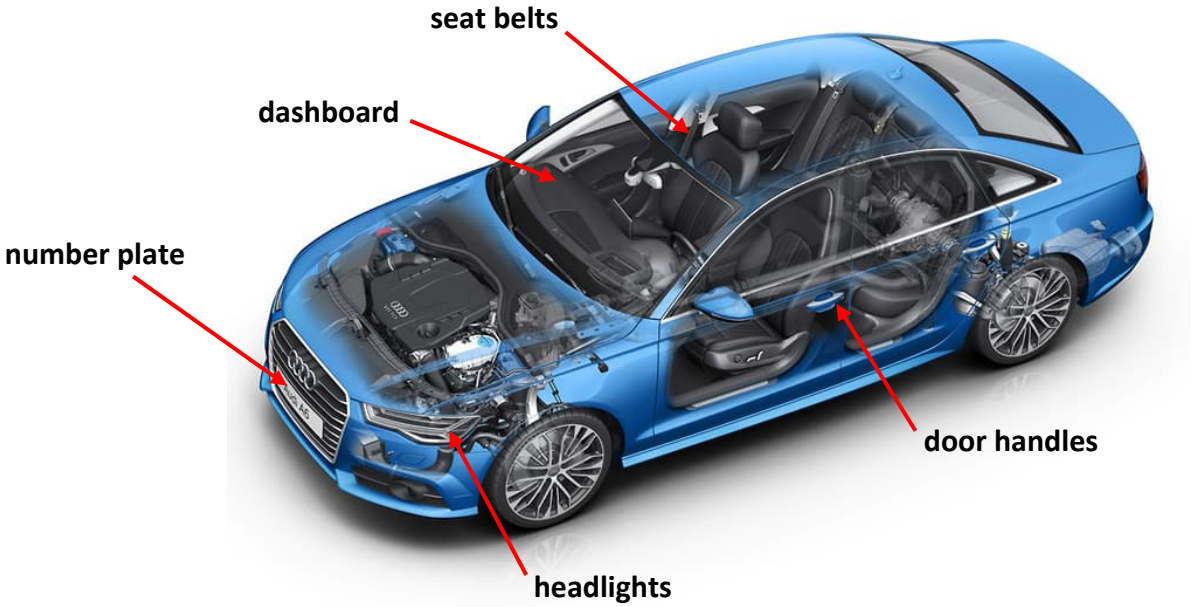
(i) Thermosetting plastics;

(ii) Thermoplastics;

(iii) Fibreglass;

(iv) Elastic memory.

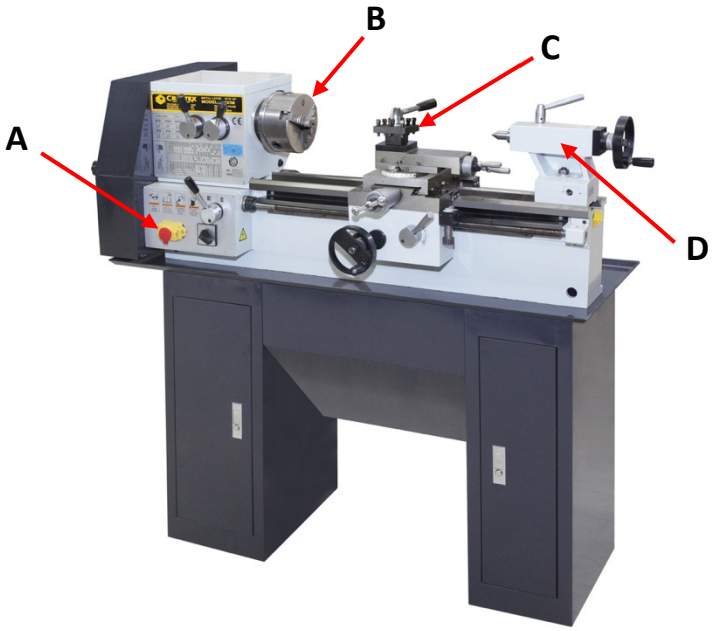
(c) Plastic is a common material found in cars. Select **any two** of the car parts labelled in the diagram and name a suitable plastic that could be used for their manufacture.



(d) List **two** safety precautions to be observed when working with hot plastics.

Question 6. **(50 marks)**

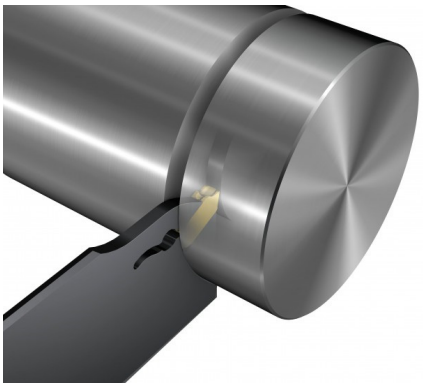
(a) Name **any three** of the labelled parts on the lathe below.



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

(i) Cutting fluid, **(ii)** Spindle speed, **(iii)** Depth of cut, **(iv)** Feed.

(c) A lathe process is shown opposite.



(i) Name the lathe process shown.

(ii) Describe how the lathe process shown is carried out.

(iii) Name **any two** other processes that can be carried out on a lathe.

OR

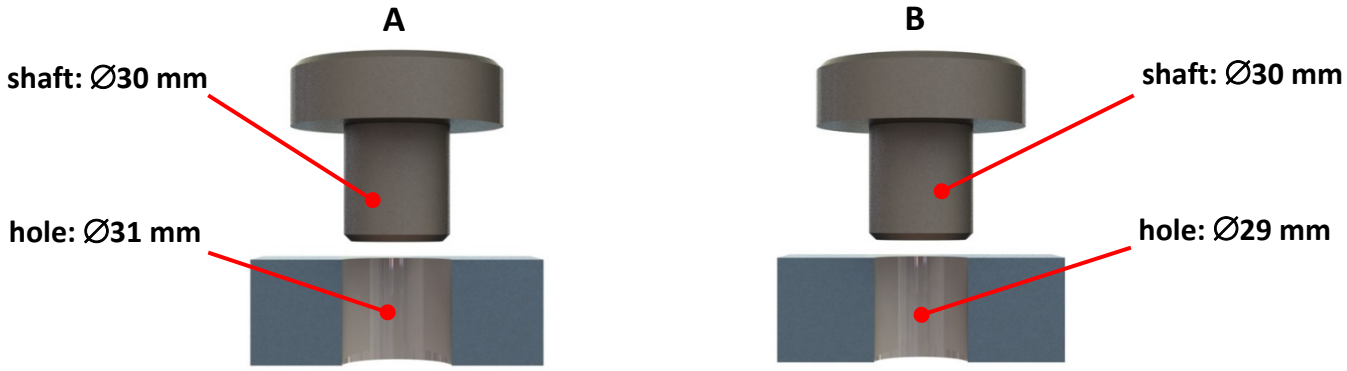
(c) Laser cutting is an important CNC (Computer Numerical Controlled) manufacturing process.

List **any three** advantages of using a laser cutter to cut out the shapes shown.



Question 7. **(50 marks)**

(a) Name the type of fit shown at **A** and the type of fit shown at **B**.



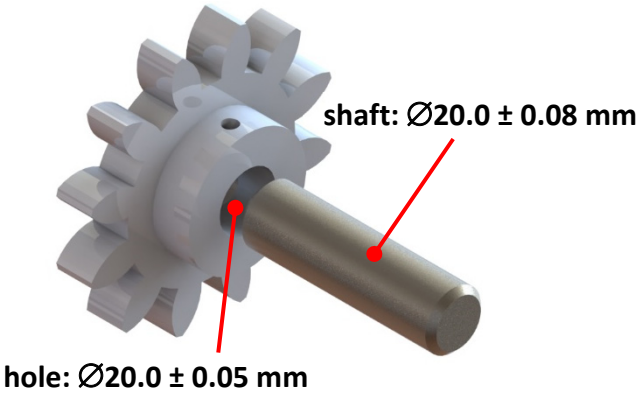
(b) A hole and shaft are machined to the dimensions shown below.

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

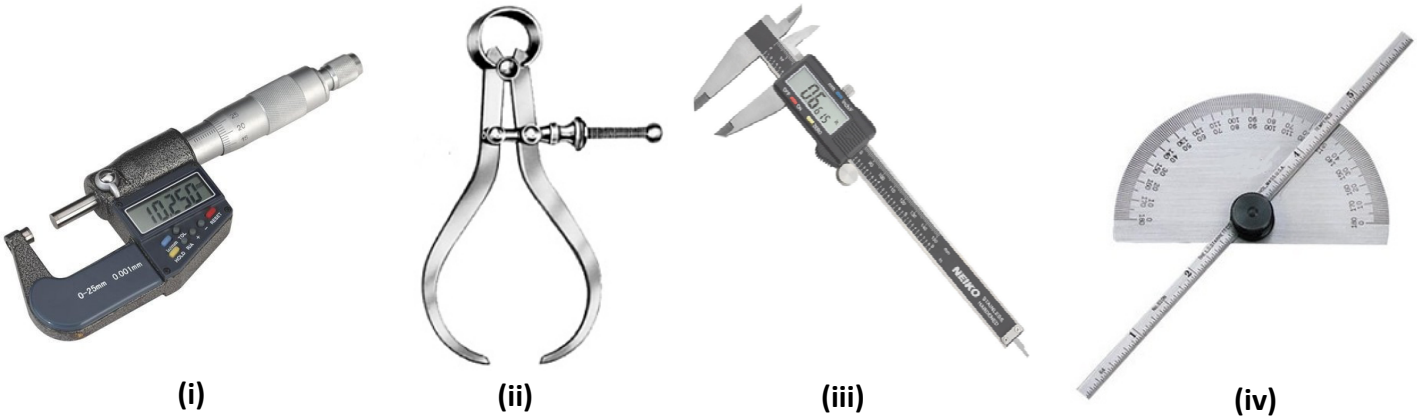
(ii) Largest diameter of the shaft;

(iii) Largest diameter of the hole;

(iv) Tolerance of the shaft.



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



(i) **(ii)** **(iii)** **(iv)**

OR

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

(i) Name a suitable electronic component that will emit light.

(ii) Name a suitable electronic component used to adjust the speed of a 9V DC motor.

(iii) Name a suitable electronic component used to start and stop the flow of current in a circuit.

(iv) Name a suitable electronic component used to provide electrical energy to a circuit.