



**Coimisiún na Scrúduithe Stáit  
State Examinations Commission**

**LEAVING CERTIFICATE EXAMINATION, 2013**

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**ENGINEERING – MATERIALS AND TECHNOLOGY**

(Ordinary Level – 200 marks)

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**THURSDAY, 6 JUNE    MORNING 9:30 – 12:00**

Answer **Section A** and **Section B** of **Question 1** 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 using a pillar drilling machine.
- (b) Name **two** non-ferrous metals.
- (c) Outline **two** advantages of Computer Numerical Control (CNC).
- (d) Name the component shown and suggest a suitable application for it.
- (e) State **two** reasons why *testing* is important in the design process.
- (f) Explain **each** of the following: (i) Countersunk (CSK) hole and (ii) Tapping size hole.
- (g) Identify the thread forms suitable for the operation of: (i) a lathe leadscrew and (ii) a car jack.
- (h) Suggest **one** suitable application for a Printed Circuit Board (PCB).



SECTION B – 35 marks

Answer **any three** of the following:

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



Strip heater



Worm and wheel mechanism



Box and pan folding machine.

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

Skype, VDU, Virus, Social networks.

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

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

Variable resistor, Rack and pinion, Compressive force, Hand vice.

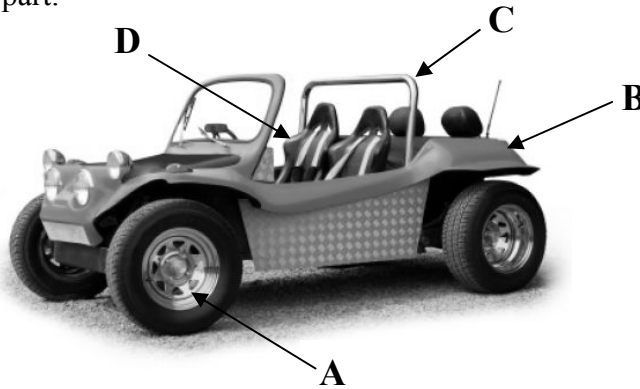
- (m) Identify the mechanism shown and suggest **one** suitable application for it.



**Question 2.**

**(45 marks)**

- (a) Select **any three** of the metal alloys listed below and identify a suitable component manufactured from **each** alloy selected:
- (i) Stainless steel,      (ii) Brass,      (iii) High speed steel,      (iv) Bronze.
- (b) (i) Name the metals produced from **any two** of the furnaces below:  
Blast furnace,      Cupola furnace,      Electric arc furnace.
- (ii) With the aid of a suitable diagram, describe **one** of the furnaces identified at 2(b)(i) above.
- (c) Select **any three** of the parts labelled A, B, C and D and name a suitable material for the manufacture of **each** part.



- (d) Identify **two** methods used to protect ferrous metals against corrosion.

**Question 3.**

**(45 marks)**

- (a) (i) Explain the difference between hardening and annealing of metals.  
(ii) Name a heat treatment process used to produce a hard surface on mild steel components.
- (b) (i) Explain how the twist drill shown below is hardened during manufacture.



- (ii) State **one** other heat treatment process used during the manufacture of a twist drill.
- (c) State **two** safety precautions to be observed when using water for cooling during the heat treatment of metals.
- (d) Explain **any two** of the following terms:  
(i) Work hardening,      (ii) Brittleness,      (iii) Tempering.

**OR**

- (d) (i) Describe **one** application for pneumatics in the manufacturing industry.  
(ii) State **one** advantage of using pneumatics in the manufacturing industry.

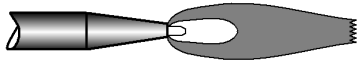


**Question 4.**

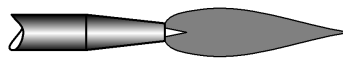
**(45 marks)**

- (a) (i) Describe the basic differences between manual metal arc welding and gas welding.  
(ii) Suggest a suitable application for **each** of the welding processes in 4(a)(i) above.

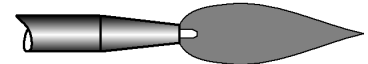
- (b) Name and describe the **three** types of oxy-acetylene flame shown.



**(i)**



**(ii)**



**(iii)**

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

- (i) State **two** advantages of using adhesives when joining materials.  
(ii) Name the special type of nut shown and state an advantage of using it.  
(iii) Outline **two** requirements to ensure a good soldered joint.  
(iv) Suggest a reason why pop riveting is suitable for joining sheet metal.



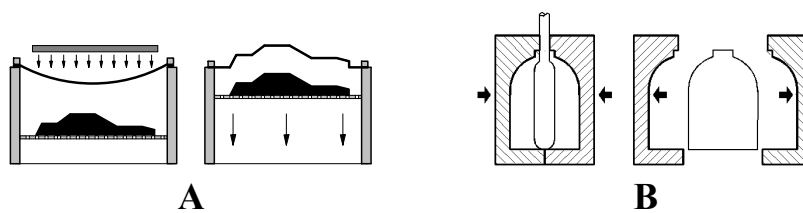
- (d) State **two** safety precautions to be observed when using oxy-acetylene equipment for brazing.



**Question 5.**

**(45 marks)**

- (a) Two plastic manufacturing processes, labelled **A** and **B**, are shown below.



- (i) Name the **two** plastic manufacturing processes labelled **A** and **B**.  
(ii) Describe any **one** of the manufacturing processes in 5(a)(i) and identify **one** component produced.

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

- (i) Thermoplastic, (ii) Dip coating, (iii) Thermosetting plastic, (iv) Elastic memory.

- (c) Name a plastic used in the manufacture of **each** of the following:

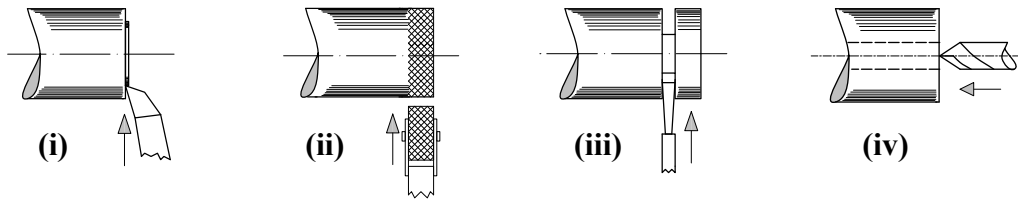
- (i) DVDs, (ii) Mobile phones.

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

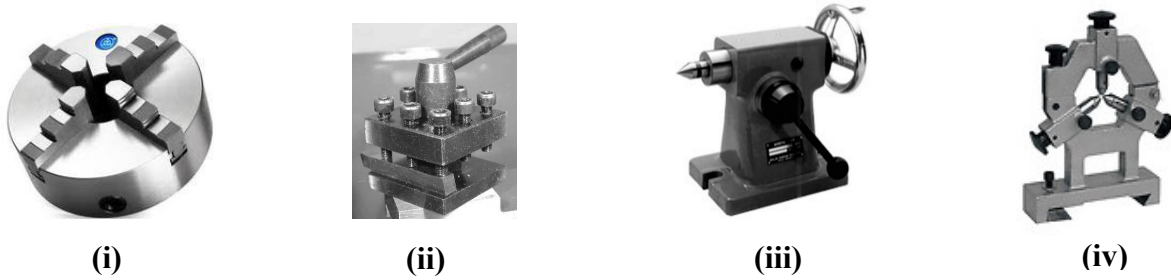
Question 6.

(45 marks)

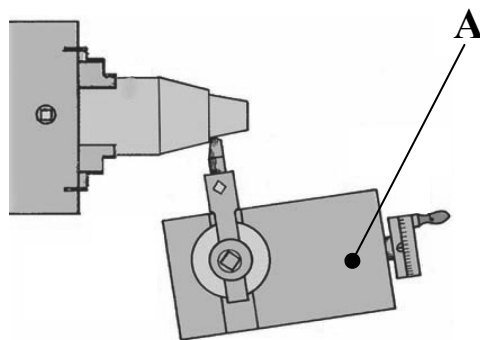
(a) Name **any three** of the lathe operations shown.



(b) Name **any three** of the lathe parts shown and give **one** use for **each** part named.



(c) A turning process used on a centre lathe is shown below.



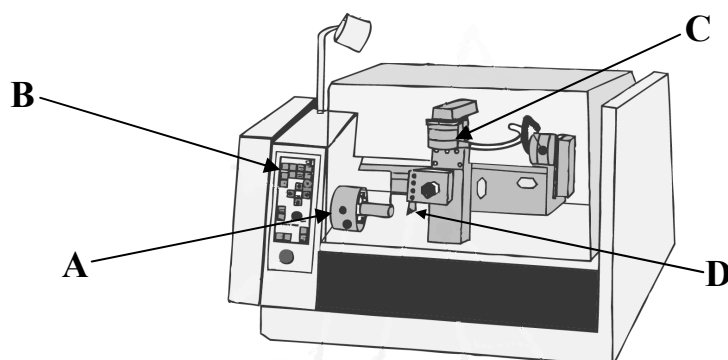
(i) Name the turning process.

(ii) Name part A used in the turning process.

(iii) State **one** safety precaution to be observed when using the turning process in 6(c)(i).

OR

(c) Name **any three** of the parts labelled A, B, C and D on the Computer Numerical Controlled lathe shown.



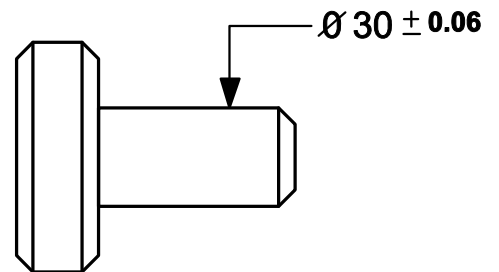
Question 7.

(45 marks)

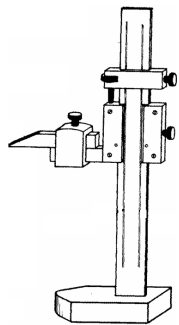
(a) Name and describe **any two** types of fit possible when assembling a shaft and hole.

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

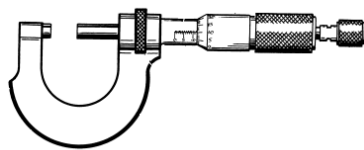
- State the:
- (i) Nominal diameter of the shaft;
  - (ii) Smallest diameter of the shaft;
  - (iii) Largest diameter of the shaft;
  - (iv) Tolerance of the shaft.



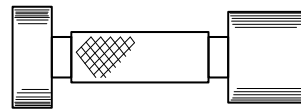
(c) Name **any three** of the instruments shown and give **one** application for **each** instrument named.



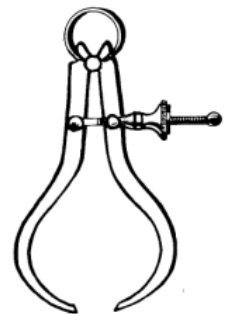
(i)



(ii)



(iii)



(iv)

OR

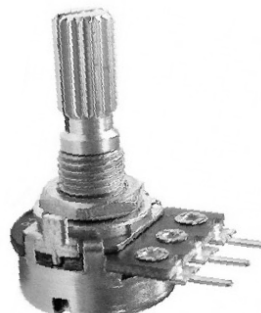
(c) Name **any three** of the components shown below and state a suitable use for **each** component named.



(i)



(ii)



(iii)



(iv)

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