Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE EXAMINATION, 2012

ENGINEERING – MATERIALS AND TECHNOLOGY

(Ordinary Level – 200 marks)

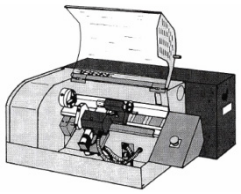
THURSDAY, 7 JUNE MORNING 9:30 – 12:00

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:

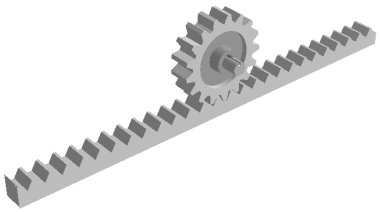


(a) List **two** safety precautions to be observed when using a Computer Numerical Control (CNC) lathe.

(b) Name the electronic component represented by the symbol shown and suggest **one** suitable application.

(c) Define the term *brittleness* in relation to the properties of metals.

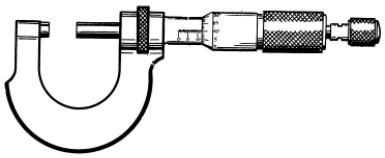
(d) State the purpose of an electrical insulator.



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

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

(g) Describe **any two** computer output devices.



(h) Identify the measuring instrument shown.

SECTION B – 35 marks

Answer **any three** of the following:

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

Four-jaw independent chuck, Plastic dip-coating tank, Sprocket and chain mechanism.

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

Webcam, Computer network, Search engine, Mobile application (app).

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

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

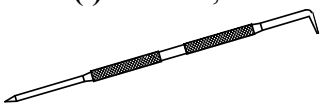
Pulley drive system, Ratchet and pawl, Pop riveting, Enameling.

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

Question 2. **(45 marks)**

(a) Name a suitable material that could be used to manufacture **each** of the following:

(i) Scriber, **(ii)** Radiator, **(iii)** Step ladder.



(b) **(i)** Name a suitable furnace that could be used to produce **each** of the following metals:

Pig iron, Cast iron, High carbon steel.

(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 metals below and state if they are ferrous or non-ferrous:

(i) Stainless steel, **(ii)** Zinc, **(iii)** Tungsten, **(iv)** Lead.

(d) Identify **any two** copper alloys.

Question 3. **(45 marks)**

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

(i) Case hardening, **(ii)** Annealing, **(iii)** Work hardening.

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

(ii) Explain why it is important to temper point **A** of the chisel.

(c) State **two** safety precautions to be observed when heat treating the point of the chisel.

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

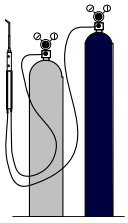
(i) Toughness, **(ii)** Ductility, **(iii)** Melting point.

OR

(d) **(i)** Describe **one** application for robotics in the manufacturing industry.

(ii) State **one** advantage for using robotics in the manufacturing industry.

Question 4. **(45 marks)**



(a) Name and sketch the type of flame produced with **each** of the following oxyacetylene gas settings:

(i) Excess oxygen;
(ii) Excess acetylene;
(iii) Equal balance between oxygen and acetylene.

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

(i) State **any two** advantages for using spot welding.
(ii) Outline **two** requirements to ensure a good adhesive joint.
(iii) Suggest a suitable method for joining light gauge aluminium.
(iv) Explain the purpose for the nylon insert used in locknuts.

(c) **(i)** State **any two** functions of a flux in the soldering process.
(ii) Explain the difference between a *passive flux* and an *active flux*.

(d) State **two** safety precautions to be observed when working in a welding environment.

Question 5. **(45 marks)**

(a) The three components shown below were manufactured from plastic materials.

Clothes hanger

Container

Socket

(i) Name the process used to manufacture **any one** of the components.

(ii) Describe with the aid of a diagram, the manufacturing process named in **5(a)(i)**.

(b) State **two** safety precautions to be observed when drilling acrylic sheet.

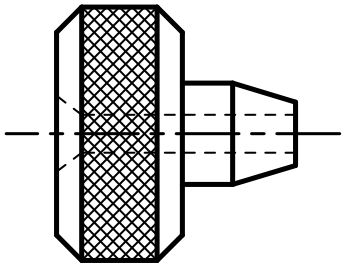
(c) Explain **any three** of the following terms used in plastic technology:

(i) Thermosetting plastic, **(ii)** Elastic memory, **(iii)** Thermoplastic, **(iv)** PVC.

(d) State **two** reasons why plastics may be hazardous to the environment.

Question 6. **(45 marks)**

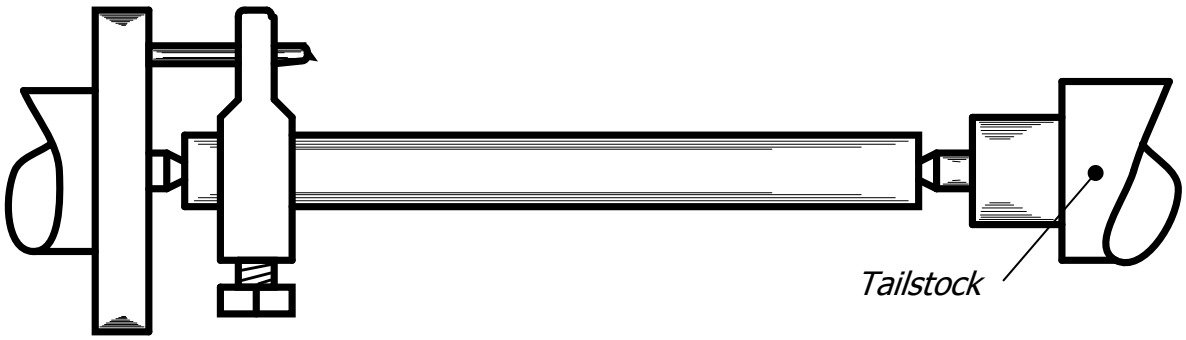
(a) The control knob shown is to be machined on a centre lathe or on a CNC lathe. Describe **any three** of the operations used to produce the control knob.



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

(i) Cutting speed, **(ii)** Depth of cut, **(iii)** Feed, **(iv)** Clearance angle.

(c) A work-holding method used to turn long shafts on a centre lathe is shown.



(i) Name the work-holding method shown.

(ii) Name **two** other methods of work-holding on the lathe.

(iii) State **one** safety precaution to be observed when turning long shafts on the centre lathe.

OR

(c) Explain **any three** of the following Computer Numerical Control (CNC) machining terms:

(i) CAD/CAM, **(ii)** Z Axis, **(iii)** G Codes, **(iv)** Canned cycle.

Question 7. **(45 marks)**

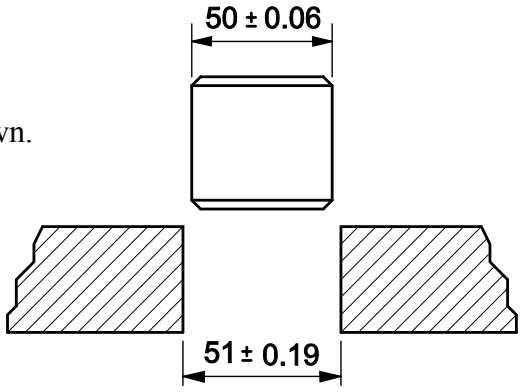
(a) Describe **any two** of the following terms in relation to limits and fits:

(i) Tolerance;

(ii) Interference fit;

(iii) Upper limit.

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



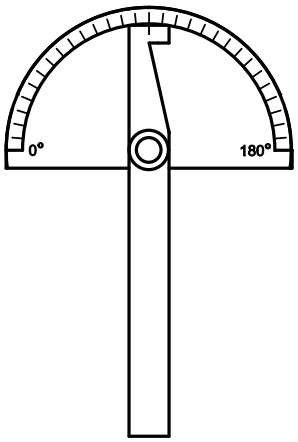
State the: **(i)** Nominal diameter of the hole;

(ii) Smallest diameter of the hole;

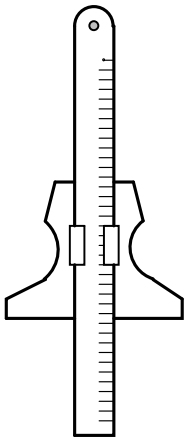
(iii) Largest diameter of the shaft;

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

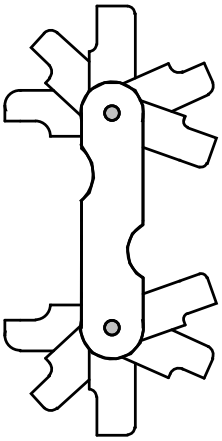
(c) Name and give **one** application for **any three** of the instruments shown.



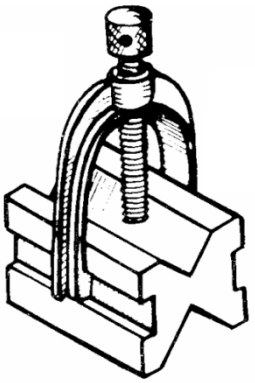
(i)



(ii)



(iii)



(iv)

OR

(c) Draw the circuit symbols for **any three** of the following electronic components:

(i) Bulb, **(ii)** Battery, **(iii)** Switch, **(iv)** Variable resistor.

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