Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE EXAMINATION, 2015

ENGINEERING – MATERIALS AND TECHNOLOGY

(Ordinary level – 200 marks)

THURSDAY, 4 JUNE MORNING, 9:30 – 12:00

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

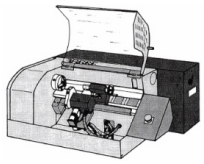
Question 1. **(65 marks)**

SECTION A – 30 marks

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

(a) List **two** safety precautions to be observed when using a strip heater to bend acrylic.

(b) Explain the term *electrical conductor* in relation to the properties of metals.

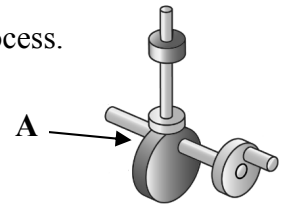


(c) State **two** operations where a centre lathe tailstock is used.

(d) State **two** advantages of using Computer Aided Manufacture (CAM).

(e) Outline **two** reasons why *testing* is essential in project work.

(f) State **two** reasons why the quality of finish is important in the manufacturing process.



(g) Name the mechanism labelled **A**, shown opposite.

(h) Name the thread forms suitable for **each** of the following:

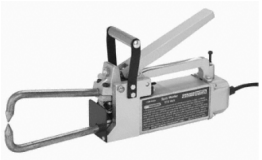
(i)
Engineering machine vice,

(ii)
Machine screw.

SECTION B – 35 marks

Answer **any three** of the following:

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



Spot welding machine

Rack and pinion mechanism

Plastic dip coating tank.

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

Software, Wireless technology, Computer simulation, USB port.

(k) Define the term *brittleness* and name a material which is brittle.

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

Printed circuit board (PCB), Metal alloy, Knurling, Worm and worm wheel.

(m) Name the **two** cutting tools shown at **(i)** and **(ii)**.

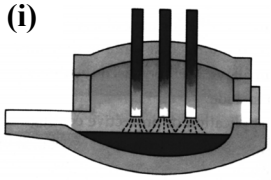
(i)

(ii)

Question 2. **(45 marks)**

(a) Name **each** of the furnaces shown.

(i)



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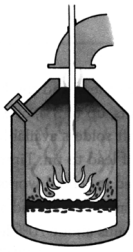

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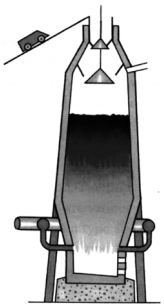


(b) Select **one** of the furnaces shown above and answer **each** of the following:

(i) Draw a diagram of the furnace and label the main parts;
(ii) Name the materials in the charge;
(iii) Describe how the charge is heated or melted;
(iv) Name the metal produced.

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

(i) Frying pan, **(ii)** Engineering square, **(iii)** Hot water cylinder.

(d) Name the metals used to produce **each** of the alloys listed below:

(i) Brass, **(ii)** Solder.

Question 3. **(45 marks)**

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

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

(b) Describe how the head of the engineering hammer shown could be hardened and tempered.

(c) State **two** safety precautions to be observed when handling hot metals during heat treatment.

(d) Outline the effects of using **each** of the following, when cooling metals during heat treatment:

- Water
- Oil.

OR

(d) State **two** applications for robotics in the manufacturing industry.

Question 4. **(45 marks)**

(a) Describe **any three** of the following soft soldering terms:

(i) Flux, **(ii)** Sweating, **(iii)** Cored solder, **(iv)** Tinning.

(b) **(i)** Name **three** types of flame which can be produced when using the oxy-acetylene torch.

(ii) State the proportions of oxygen and acetylene required for **each** of the three flames at **4(b)(i)**.

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

(i) Describe how heat is produced during manual metal arc welding.
(ii) Name a suitable method used to join light gauge aluminium.
(iii) List **two** safety precautions to be observed when soldering electrical circuits.
(iv) Name the type of machine screw shown and suggest a suitable application.

(d) Explain **two** reasons why the face must be protected during manual metal arc welding.

Question 5. **(45 marks)**

(a) The three items shown below are manufactured from plastic materials.

Ice cube tray

Sports bottle

Toothbrush

(i) Identify a manufacturing process used in the production of **each** of the items shown above.

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

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

(c) Explain **any three** of the following terms associated with plastic technology:

(i) Thermoplastic, **(ii)** Fibreglass, **(iii)** Thermoforming, **(iv)** Thermosetting plastic.

(d) Describe a procedure used to produce a highly finished edge on an acrylic sheet.

Question 6. **(45 marks)**

(a) Identify **any three** of the lathe components shown.

(i)

(ii)

(iii)

(iv)

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

(i) Taper turning, **(ii)** Spindle speed, **(iii)** Cutting fluids, **(iv)** Feed.

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

(i) Name this chuck.

(ii) Describe **two** applications for the chuck shown.

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

OR

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

(i) CAD, **(ii)** X-axis, **(iii)** Stepper motor, **(iv)** Safety switch.

Question 7. **(45 marks)**

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

(i) Lower limit, **(ii)** Interference fit, **(iii)** Allowance.

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

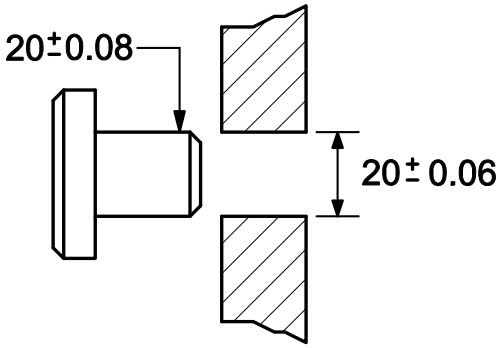
State the:

(i) Nominal diameter of the hole;

(ii) Largest diameter of the hole;

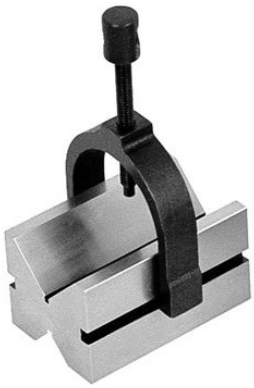
(iii) Smallest diameter of the shaft;

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



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

(i)



(ii)

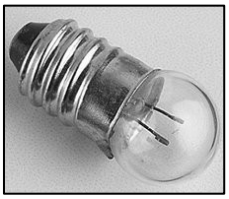
(iii)

(iv)

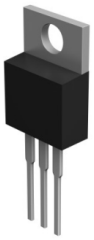
OR

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

(i)



(ii)



(iii)

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