



**Coimisiún na Scrúduithe Stáit
State Examinations Commission**

JUNIOR CERTIFICATE EXAMINATION, 2008

MATERIALS AND TECHNOLOGY

METALWORK – HIGHER LEVEL

100 Marks

Tuesday, 17 June – 2.00 – 4.00

INSTRUCTIONS

- 1. Answer Sections A and B of Question 1 and three other questions.**
- 2. All answers must be written in ink on the answer book supplied. Diagrams should be drawn in pencil.**
- 3. Squared paper is supplied for diagrams as required.**
- 4. Please label and number carefully each question attempted.**

**SECTION A – 20 MARKS
COMPULSORY**

Answer **any five** questions.

The diagram, Fig. 1, shows some of the main parts of a basic four-stroke engine.

Questions (b) to (e) relate to this diagram.

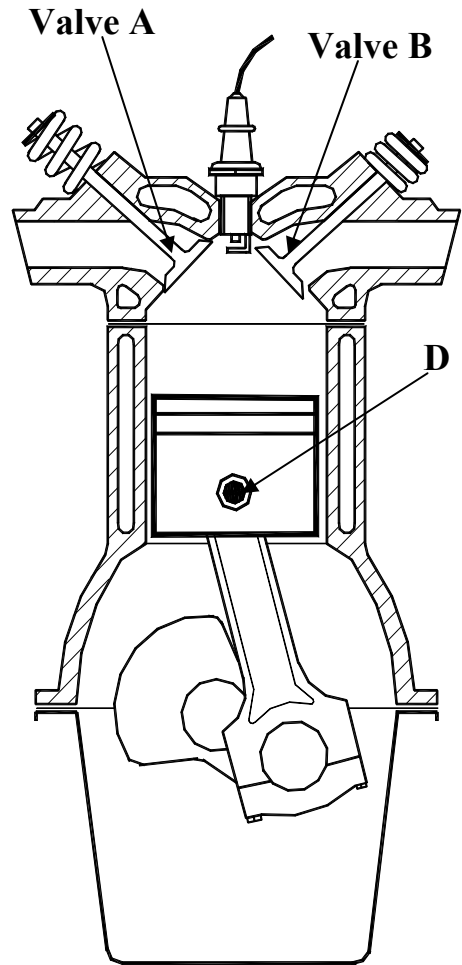


Fig.1

- (a) Briefly describe the contribution made to technology by **one** of the following people:
 - (i) John B. Dunlop, or
 - (ii) John L. Baird, or
 - (iii) James Watt. (4 marks)
- (b) (i) Identify **each** of the valves shown.
 (ii) Name the engine stroke for which Valve A opens.
 (iii) Name the engine stroke for which Valve B opens. (4 marks)
- (c) Describe the mechanisms used to open and close the valves. (4 marks)
- (d) (i) Identify part 'D'.
 (ii) State the purpose of part 'D'. (4 marks)
- (e) (i) Name **one** other type of engine.
 (ii) Suggest a suitable application for the engine named. (4 marks)

- (f) Define **any two** of the following material properties:
 - (i) Hardness;
 - (ii) Malleability;
 - (iii) Toughness;
 - (iv) Elasticity. (4 marks)

- (g) (i) Identify **any two** of the electronic components shown.
 (ii) Draw the electronic symbol for **one** of the components identified. (4 marks)



**SECTION B – 20 MARKS
COMPULSORY**

Answer **any five** questions.

The drawings show the Rear Wheel Guard, Electronic Circuit and an Assembly Drawing of the 2008 Metalwork Higher Level Project, Model Quad Bike.

- (a) (i) Calculate the overall length of the rear wheel guard.
 (ii) Describe how the 48 mm × 40 mm section marked 'X' on the rear wheel guard is shaped.

(4 marks)

- (b) (i) Explain how to locate the centre of the R25 arc when marking out the rear wheel guard.
 (ii) Describe how the rear wheel guard is bent to shape.

(4 marks)

- (c) (i) Explain the term *knurling* as used to make the rear wheels.
 (ii) List **any two** other lathe processes used to make the rear wheels.

(4 marks)

- (d) (i) Explain the function of the DPDT switch used in the electronic circuit.
 (ii) Outline the purpose of the resistor used in the electronic circuit.

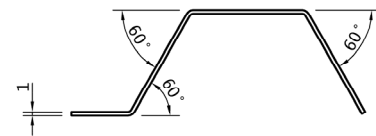
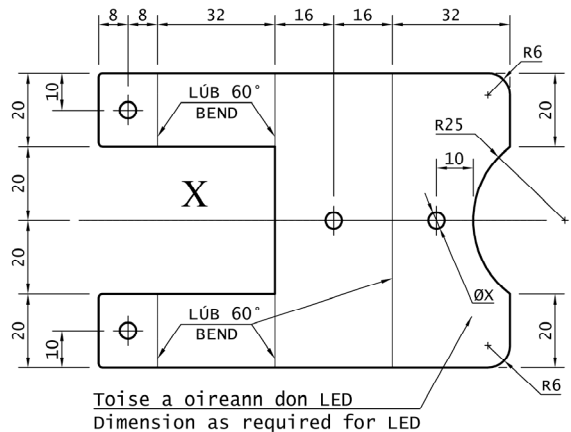
(4 marks)

- (e) Design, using a diagram, a suitable front wheel support and steering mechanism for the Quad Bike.

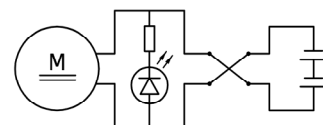
(4 marks)

- (f) Suggest **any two** suitable applications for a Quad Bike.

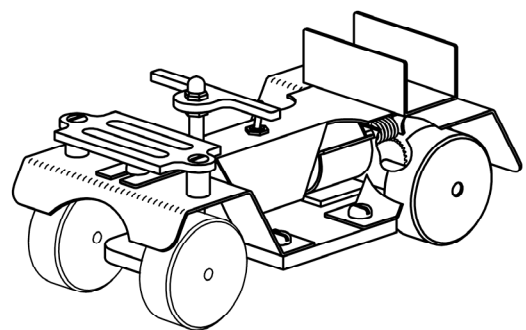
(4 marks)



Rear Wheel Guard



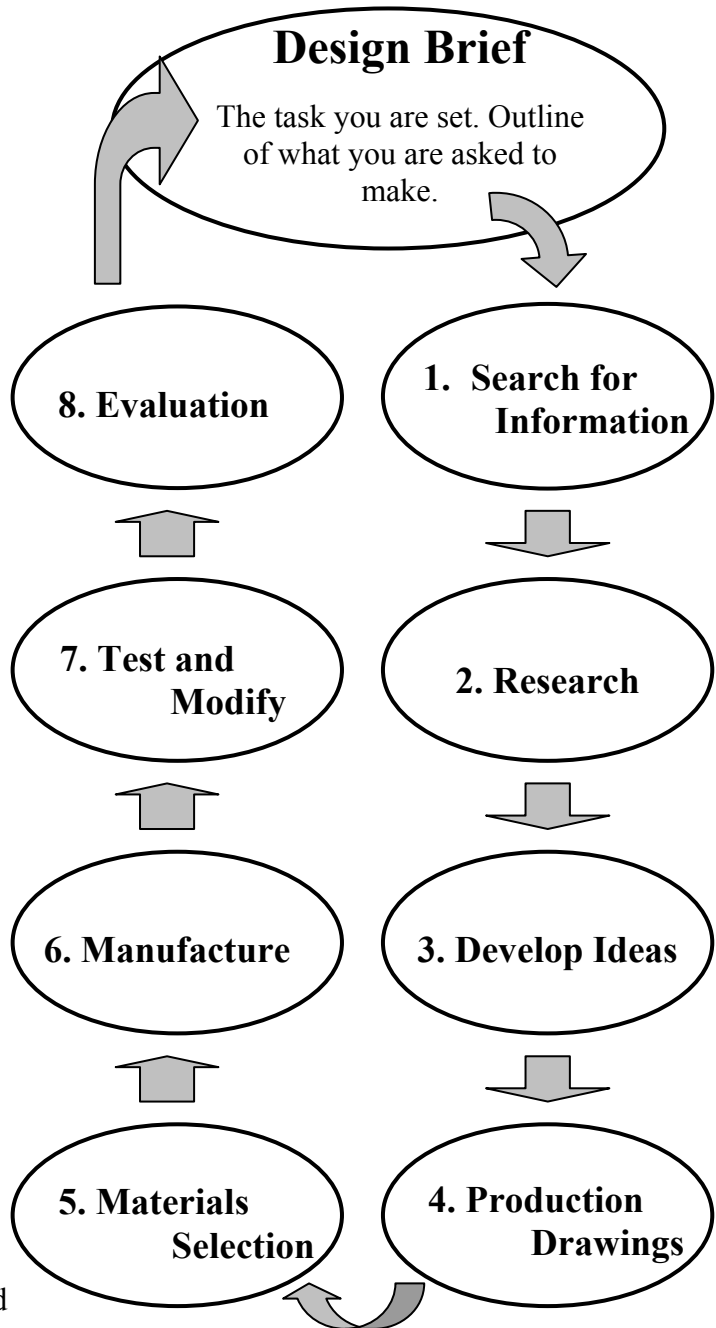
Electronic Circuit



Model Quad Bike

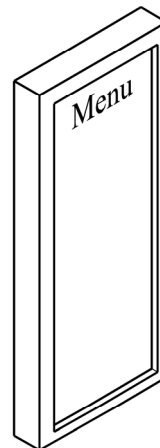
A simple model of a design process is shown opposite.

- (a) (i) Outline **any three** possible sources used to “Search for Information”.
- (ii) Describe **any two** ways in which ideas could be developed following the “Research” stage. (7 marks)



A double-sided menu board to be placed on the footpath outside a café is shown.

- (b) (i) Design a suitable metal stand to hold the board.
- (ii) Show, using a diagram, how the board is securely attached to the stand.
- (iii) Suggest a suitable metal for the stand.
- (iv) Describe a suitable finish which should be applied to the chosen metal. (13 marks)

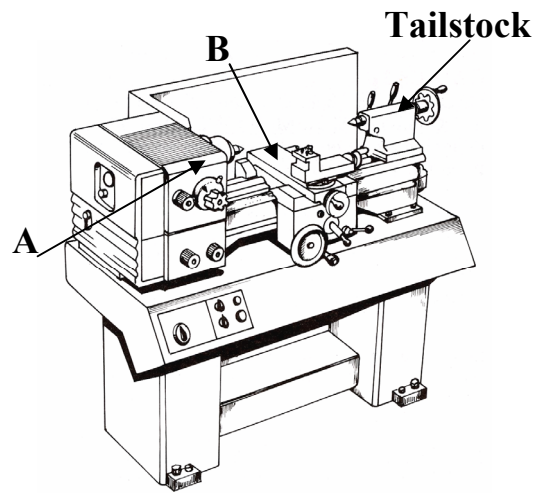


Menu Board

3

20 Marks

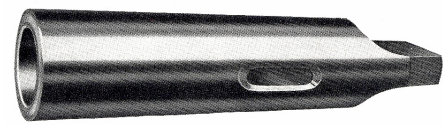
- (a) (i) Name parts 'A' and 'B' of the lathe shown.
 (ii) Outline **any two** functions of the tailstock.
 (iii) State **any two** reasons why lathes are designed to run at different speeds (RPM).
 (iv) List **any two** safety precautions to be observed when working on the lathe.
 (10 marks)



- (b) A 10 mm diameter bar is to be turned on the lathe. The material has a surface cutting speed of 78 m/min. Using the given formula calculate the speed in RPM (Take π as 3).

$$N = \frac{S \times 1000}{\pi \times D}$$

(4 marks)



Tool A

- (c) (i) Name **each** of the tools shown opposite.
 (ii) Explain the purpose of **one** of the tools.
 (6 marks)

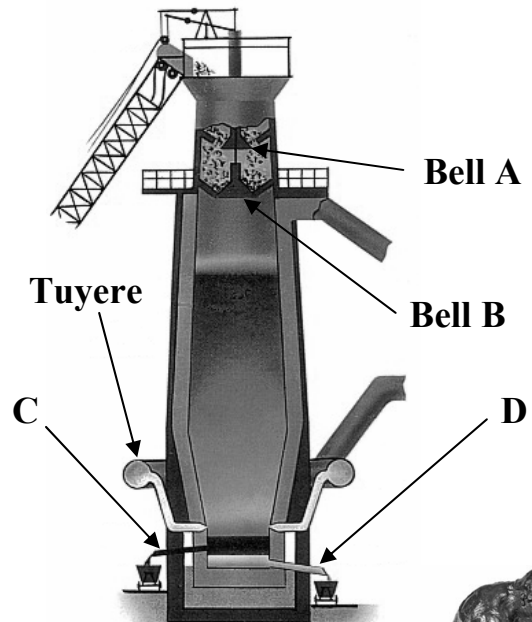


Tool B

4

20 Marks

- (a) (i) Name the type of furnace shown.
 (ii) With reference to bells 'A' and 'B', explain how the charge is put into the furnace without heat loss.
 (iii) Explain the purpose of the tuyere.
 (iv) Outline the function of chutes 'C' and 'D'.
 (8 marks)



- (b) (i) Name **any two** non-ferrous metals.
 (ii) Suggest **one** suitable application for **each** metal named.
 (4 marks)

- (c) (i) List the elements used to make **each** of the following alloys:
 ➤ Bronze;
 ➤ Stainless steel.

- (ii) Identify the alloy used to manufacture **each** of the objects shown.



Sink



Statue

(8 marks)

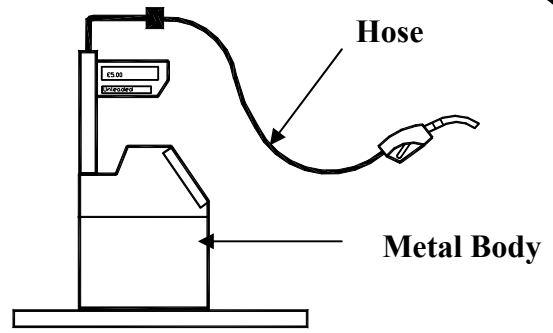
5

20 Marks

A fuel pump, pulley and belt drive mechanism and a vee belt system are shown.

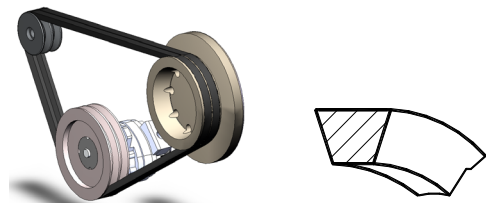
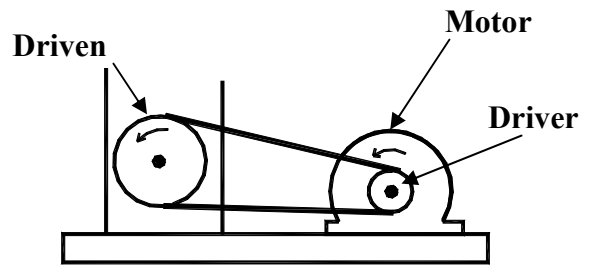
- (a) (i) Name **one** suitable material for **each** fuel pump part labelled.
(ii) State **one** reason for the selection of **each** material.
(iii) Outline **any two** safety precautions to be observed when using a fuel pump.
(iv) Describe **any two** environmental effects caused by the use of petrol.

(10 marks)



- (b) (i) Identify **any two** other drive mechanisms.
(ii) Explain, using a diagram, how the direction of rotation of the driven pulley may be reversed.
(iii) Outline **one** advantage of a vee belt pulley system.

(10 marks)



Vee belt system

6

20 Marks

(a) Compare the **two** soldering irons shown using the following guidelines:

- (i) Name of soldering iron;
(ii) Method of heating;
(iii) Material used in the bit;
(iv) Material used in the handle;
(v) **One** safety precaution to be observed with **each** iron.



Iron A

(b) Select **any two** of the following and explain the difference:

- (i) between a conductor and an insulator;
(ii) between a passive flux and an active flux;
(iii) between soft solder and silver solder.

(6 marks)



Iron B

- (c) (i) Name **any two** common thermoplastics.
(ii) Suggest **one** suitable application for **each** plastic named.

(4 marks)

Name	Input/output	Application
Mouse	Input	
Digital camera		Images/pictures
Plotter	Output	

(a) (i) Redraw the given table into your answer book. Complete the table by filling the missing input/output and application boxes.

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

- Byte;
- File;
- VDU;
- CD-ROM.

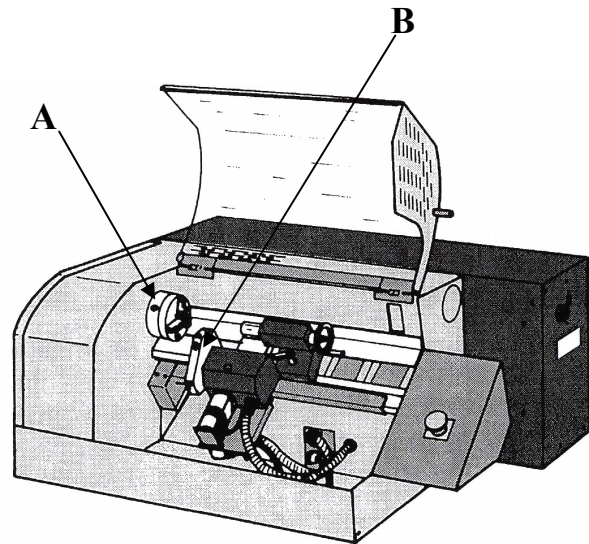
(iii) Name parts 'A' and 'B' of the CNC lathe shown.

(iv) Identify **any two** safety features of the CNC lathe.

(v) For **each** of the following state the difference:

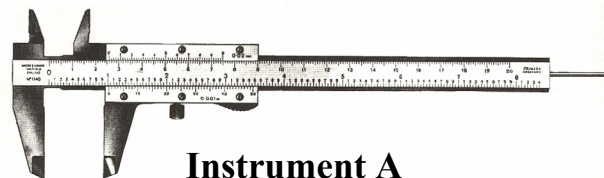
- between G codes and M codes;
- between Absolute dimensioning and Incremental dimensioning.

(14 marks)



CNC Lathe

(b) (i) Name **each** of the measuring instruments shown.

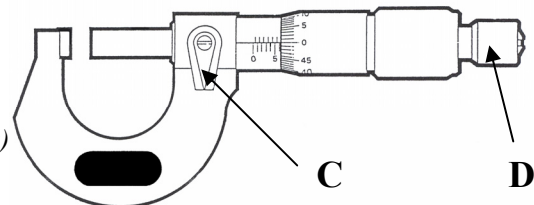


Instrument A

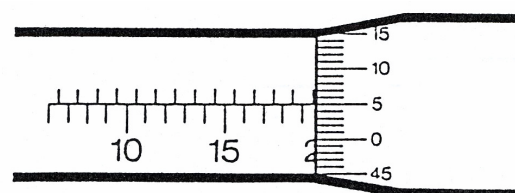
(ii) Identify parts 'C' and 'D'.

(iii) What is the value of the reading shown below opposite?

(6 marks)



Instrument B



Blank Page