



**Coimisiún na Scrúduithe Stáit
State Examinations Commission**

JUNIOR CERTIFICATE EXAMINATION, 2010

**MATERIALS AND TECHNOLOGY
METALWORK**

Higher level – 100 Marks

Tuesday, 22 June Afternoon 2:00 – 4:00

INSTRUCTIONS

1. Answer Question 1, Section A and B, 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 diagrams in Fig. 1, show four of the main parts of a basic four-stroke engine.

Questions (a) to (d) relate to these diagrams.

- (a) (i) Name part A.
(ii) Suggest a suitable material to make part A.
(4 marks)

- (b) (i) Name part B.
(ii) Explain the purpose of part B.
(4 marks)

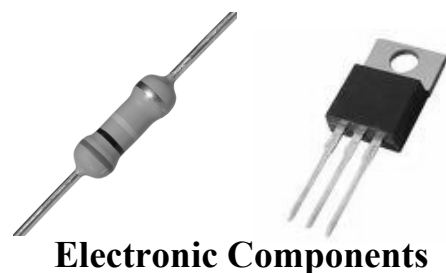
- (c) Outline the function of the Crankshaft in the engine.
(4 marks)

- (d) Describe how the Camshaft activates the inlet / exhaust valves.
(4 marks)

- (e) Briefly describe the contribution made to technology by **one** of the following people:
(i) Mary Anderson, or
(ii) Alessandro Volta, or
(iii) Linus Yale.
(4 marks)

- (f) (i) Explain the difference between ferrous and non-ferrous metals.
(ii) Name **any two** non-ferrous metals.
(4 marks)

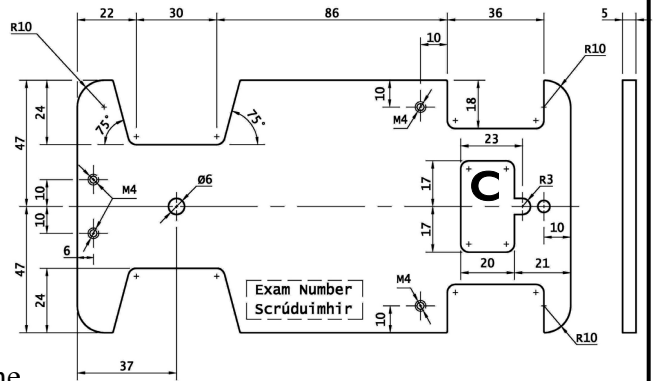
- (g) (i) Identify **both** of the electronic components shown.
(ii) Outline the function of **one** of the electronic components shown.
(4 marks)



**SECTION B – 20 MARKS
COMPULSORY**

Answer **any five** questions.

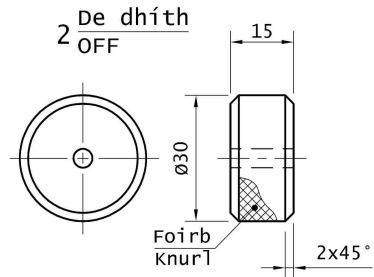
The drawings show the Chassis, Wheel, Electronic circuit and an assembly drawing of the 2010 Metalwork Higher Level Project, Model Go-Kart.



Chassis

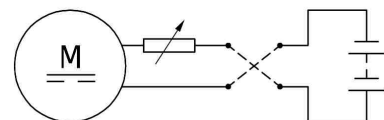
- (a) (i) Calculate the overall dimensions of the Chassis.
 - (ii) Describe how slot **C** is shaped at the rear of the Chassis.
- (4 marks)*

- (b) (i) Outline **any two** precautions to be taken when drilling the acrylic Chassis to prevent it from breaking.
 - (ii) Describe how a good quality finish may be achieved on the acrylic Chassis.
- (4 marks)*



Wheel

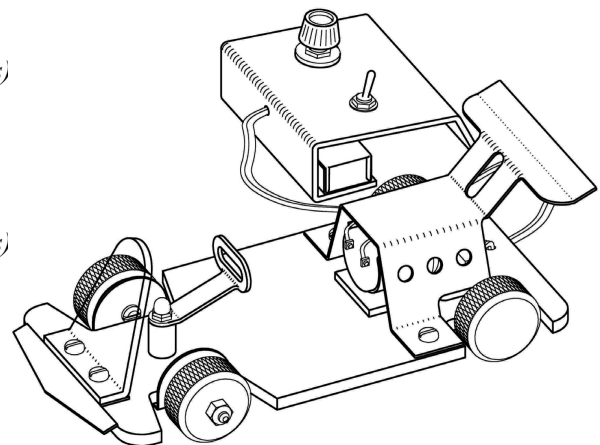
- (c) (i) Describe how a Knurled finish is achieved on the wheels.
 - (ii) Explain how the $2 \times 45^\circ$ tapers are produced on the wheels.
- (4 marks)*



Electronic Circuit

- (d) Describe the operation of the electronic circuit with particular reference to:
 - (i) the DPDT switch;
 - (ii) the potentiometer.
- (4 marks)*

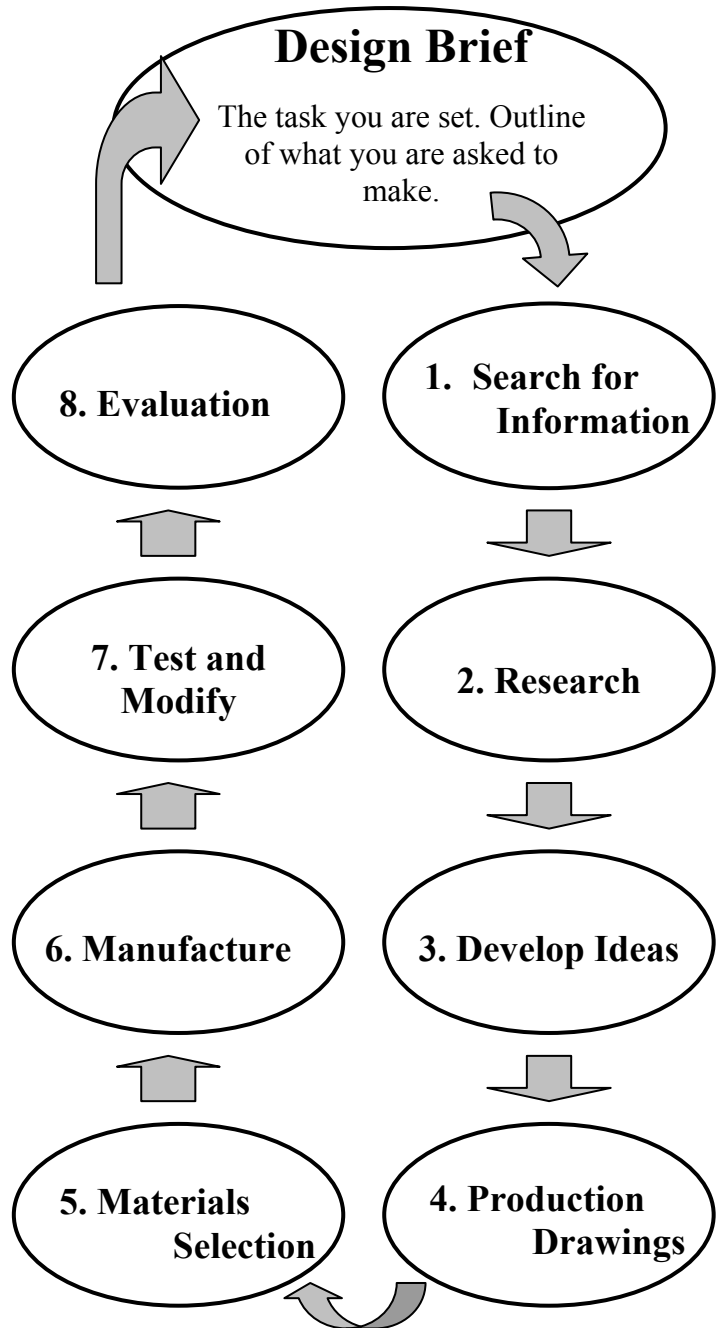
- (e) Design, using a diagram, a seat for the Go-Kart which is capable of linear adjustment.
- (4 marks)*



Model Go-Kart

- (f) (i) Design a suitable safety bar for the Go-Kart.
 - (ii) Illustrate how the safety bar may be attached behind the seat of the Go-Kart.
- (4 marks)*

A simple model of a design process is shown opposite.



- (a) (i) List **any three** sources of information you might use at the “Search for Information” stage.
- (ii) Outline **any two** factors to be considered at the “Evaluation” stage.
- (7 marks)*

Concrete steps leading up to the front of a building are shown.

- (b) (i) Design, with the aid of a diagram, a suitable metal handrail to be located up along the centre of the steps.
- (ii) Show, using a diagram, how the handrail is to be attached to the steps.
- (iii) Name **one** suitable metal from which the handrail may be manufactured.
- (iv) Suggest **one** suitable finish for the metal handrail.
- (13 marks)*

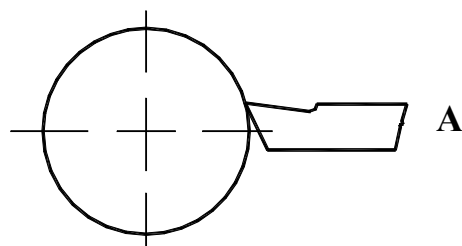


Question 3

20 Marks

- (a) (i) Select the correct tool height setting **A**, **B** or **C**, required to face-off the workpiece.
- (ii) Explain **any two** reasons for your selection.

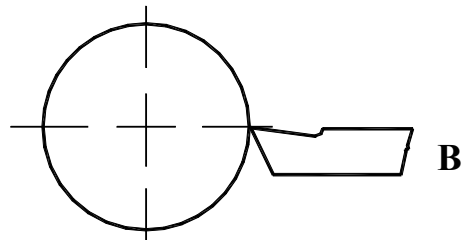
(8 marks)



- (b) An 8 mm diameter bar is to be turned on the lathe. The material has a surface cutting speed of 60 m/min. Using the given formula calculate the speed in RPM. (Take π as 3)

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

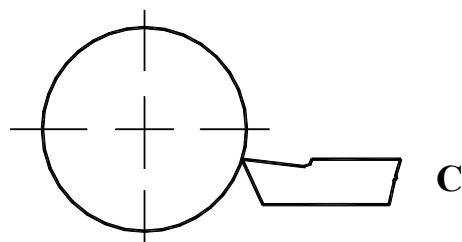
(4 marks)



- (c) With reference to the Centre Lathe, select **any two** of the following, and explain the difference between:

- (i) Facing and Parallel Turning;
 (ii) a Tool Holder and a Toolpost;
 (iii) the Rake Angle and the Clearance Angle.

(8 marks)



Question 4

20 Marks

- (a) (i) Name the type of furnace shown.
 (ii) List the materials in the charge.
 (iii) Describe how heat loss is prevented from this furnace.
 (iv) Name **any two** steel producing furnaces.

(9 marks)

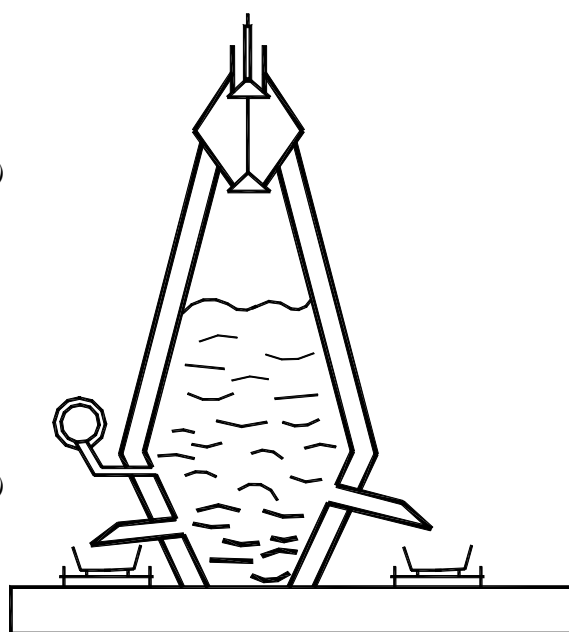
- (b) Define **any two** of the following material properties:

- (i) Hardness;
 (ii) Conductivity;
 (iii) Ductility;
 (iv) Elasticity.

(6 marks)

- (c) (i) Name **any two** heat treatments which may be carried out on steel.
 (ii) Describe **one** of the heat treatment processes named.

(5 marks)



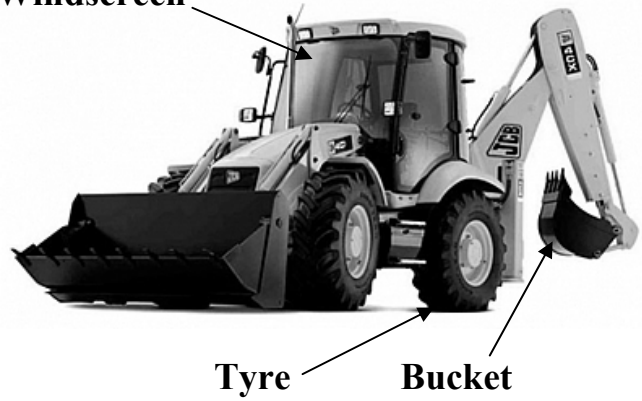
Question 5

20 Marks

An Excavating Digger is shown opposite.

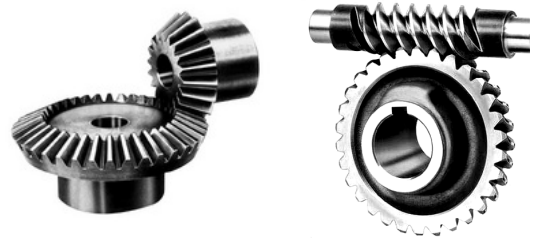
Windscreen

- (a) (i) Name a suitable material for **each** part labelled.
- (ii) State **one** reason for the selection of **each** material.
- (iii) Outline **any two** safety features of an Excavating Digger.
- (iv) State **any two** methods of recycling used or damaged digger components in an environmentally friendly manner.



(10 marks)

- (b) (i) Identify **one** of the drive mechanisms shown opposite.
- (ii) Suggest **one** suitable application for your chosen mechanism.
- (iii) List **any two** reasons why it is necessary to lubricate the drive mechanism.
- (iv) Name **one** suitable lubricant for your chosen mechanism.



Drive Mechanisms

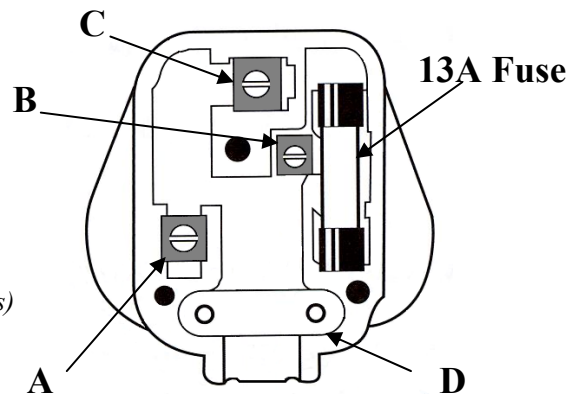
(10 marks)

Question 6

20 Marks

- (a) (i) Name **each** of the plug terminals marked **A**, **B** and **C**.
- (ii) State which colour wire should be connected to **each** terminal.
- (iii) Explain the purpose of the 13A fuse fitted to the plug.
- (iv) What is the purpose of part **D** shown.

(10 marks)



- (b) (i) Name **any two** metals used to make soft solder.
- (ii) List **any two** properties of soft solder that make it suitable for joining electronic components.
- (iii) Outline the purpose of flux when soldering.
- (iv) The Soldering Iron shown is rated 110V, 15W. Explain the meaning of this rating.
- (v) State **any two** safety precautions to be observed when soldering.

(10 marks)



(a) (i) Four computer devices labelled **A**, **B**, **C** and **D** are shown. Outline the purpose of **each** device.

(ii) Classify **each** device as input or output.

(iii) Briefly explain the difference between computer hardware and computer software.

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

- Scanner
- CD Writer
- Broadband
- Twitter.

(v) Describe briefly how to protect a Personal Computer (PC) from:

- Virus
- Electrical surge.



A



B



C



D

(14 marks)

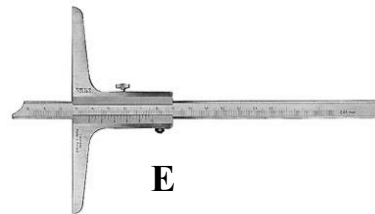
Computer Devices

(b) (i) Name **both** of the measuring instruments labelled **E** and **F** as shown.

(ii) Suggest a suitable application for **one** of the instruments.

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

(6 marks)

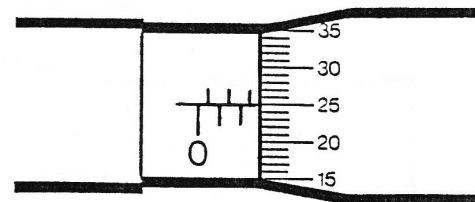


E



F

Measuring Instruments



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