# Coimisiún na Scrúduithe Stáit
# State Examinations Commission

*Leaving Certificate Applied, 2005*

# Vocational Specialism – Engineering
## (240 marks)

**Sample Answers – Marking Scheme**

Monday 13th June, 2005

Morning 9.30 a.m. – 11.00 a.m.

### *General Directions to Candidates*

1. Write your EXAMINATION NUMBER in this space.
2. Answer all questions from Section 1.
3. Answer ANY THREE questions from Section 2.
4. Write your answers in the spaces provided and include sketches as appropriate.
5. Hand up this paper at the end of the examination.
6. If Question 7 is attempted, answer any two topics.

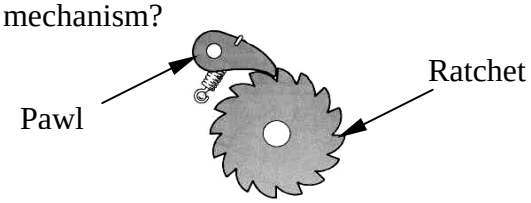
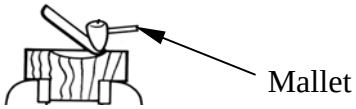
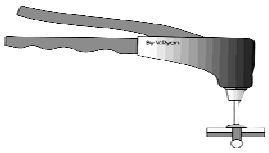
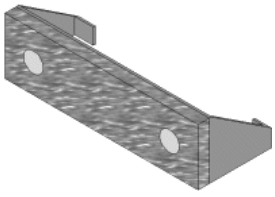
| *For the Superintendent only* | *For the Examiner only* | |
|---|---|---|
| *Centre Stamp* | 1. Total of end of page totals | |
| | 2. Aggregate total of all disallowed questions | |
| | 3. Total mark awarded (1 minus 2) | |
| | 4. Bonus mark for answering through Irish (if applicable) | |
| | 5. Total mark awarded if Irish Bonus (3 plus 4) | |
| | Note: The mark in row 3 (or row 5 if Irish bonus is awarded) must equal the total mark on the flap at the end of the script. | |

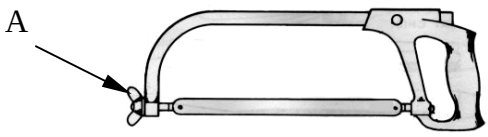
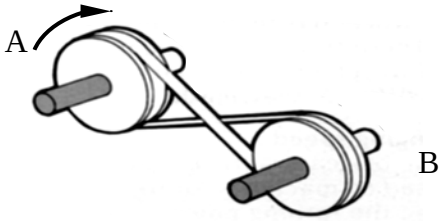
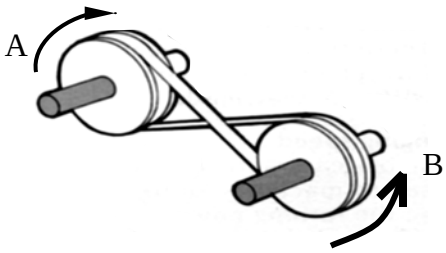
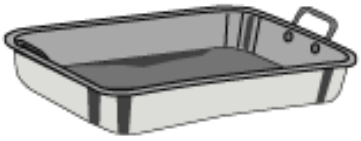
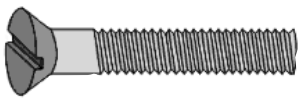
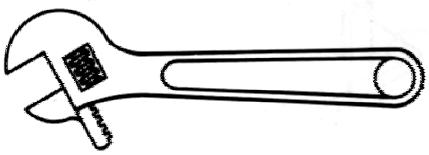
# *Section 1* (90 Marks)

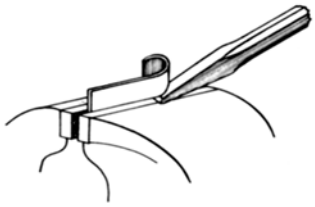
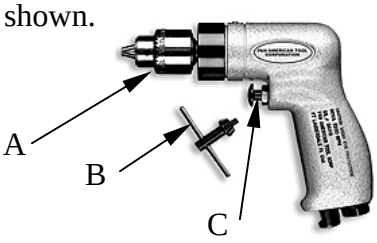
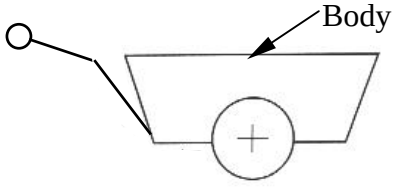
**Answer all three questions**

*Section 1* **Q1.** **45 marks**

**Give brief answers to any fifteen of the following.**
(Sketches may be used to explain your answers).

| QUESTION | ANSWER |
|---|---|
| (a) What is the purpose of the pawl in this mechanism?   | Purpose To prevent ratchet unwinding.<br>3 marks |
| (b) Give one reason for using a wooden mallet when hollowing, as shown.   | Reason To prevent the work being damaged.<br>3 marks |
| (c) Name the type of fastener shown and give an example of where it is used.  | Name Pop rivet<br>Use Joining sheet metal<br>2 + 1 marks |
| (d) Name the tool shown and state its use.  | Tool Spring dividers/compass<br>Use Drawing circles<br>2 + 1 marks |
| (e) State the reason for using a soft jaw, as shown, in an engineers vice.  | Reason To protect work from damage<br>3 marks |

| QUESTION | ANSWER |
|---|---|
| (f) What is the name and purpose of part 'A' on the hacksaw shown?<br>  <br> | Name Wing nut<br>Purpose Tension blade<br>2 + 1 marks |
| (g) If pulley 'A' rotates as shown, indicate with an arrow the direction of pulley 'B'.<br>  <br> | 3 marks<br>  <br> |
| (h) Name a suitable material to make a cooking pan, as shown, and state why this material is suitable.<br>  | Material Aluminium<br>Reason Light<br>2 + 1 marks |
| (i) Name the screw head shown, and give a reason for its use.<br>  | Name Countersunk<br>Use To finish flush with surrounding materials<br>2 + 1 marks |
| (j) Name the spanner shown and state where it is used.<br>  | Name Adjustable<br>Use To fit various sized nuts<br>2 + 1 marks |

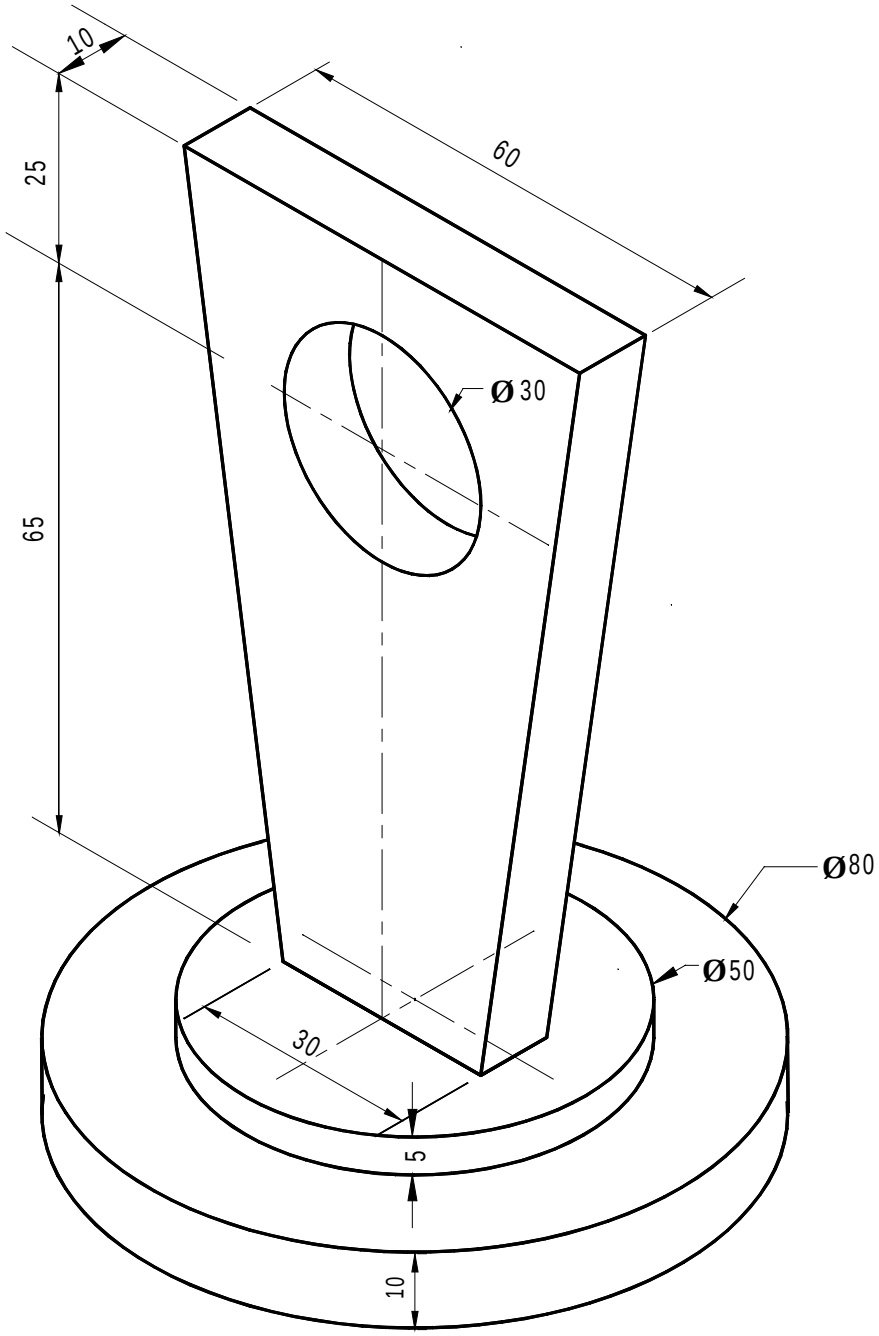
| QUESTION | ANSWER |
|---|---|
| (k) Give a reason why the handle of a pliers, as shown, is coated with plastic.  | Reason To prevent electric shock<br><br>3 marks |
| (l) State **one** safety precaution that should be observed when using a chisel, as shown.  | Safety precaution Wear goggles<br><br>3 marks |
| (m) Name the **three** parts of the drilling machine shown.   | A Chuck<br>B Chuck key<br>C Switch<br><br>3 x 1 marks |
| (n) Name a suitable material for the body of the barrow shown and give a reason for this choice of material.   | Material Plastic<br>Reason Easy to shape<br><br>2 + 1 marks |
| (o) What is the purpose of the electrical device shown?  | Purpose To turn an electrical supply on and off<br><br>3 marks |

| QUESTION | ANSWER |
|---|---|
| (p) Give **one** use for the centre punch shown in this sketch.  | Use To mark an exact centre position for drilling<br><br>3 marks |
| (q) Name the tool shown and state its use.  | Name File card<br>Use To clean grit from files<br><br>2 + 1 marks |
| (r) What does each safety symbol shown below indicate?<br>A  B  | Symbol 'A' Wear goggles<br><br>Symbol 'B' Wear helmet<br><br>2 + 1 marks |
| (s) Give **one** advantage for using a cordless drill as shown.  | Advantage Safer/ low voltage - no shock<br><br>3 marks |
| (t) Name a suitable material used to make this cutlery tray and give a reason for the choice of this material.  | Material Plastic<br>Reason Easy to clean<br><br>2 + 1 marks |

*Section 1* **Q2.** **25 marks**

A pictorial view of a plaque is shown below.

(a) Complete the elevation and plan of the plaque on the grid paper opposite.

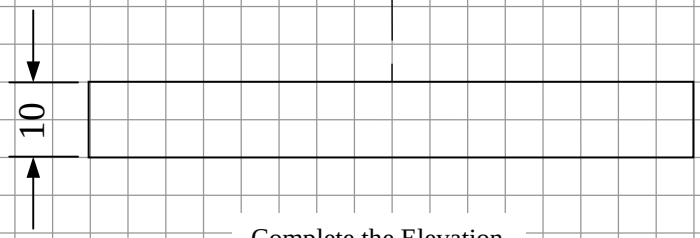


(b) One dimension is shown. Insert **three** other dimensions on your drawing.

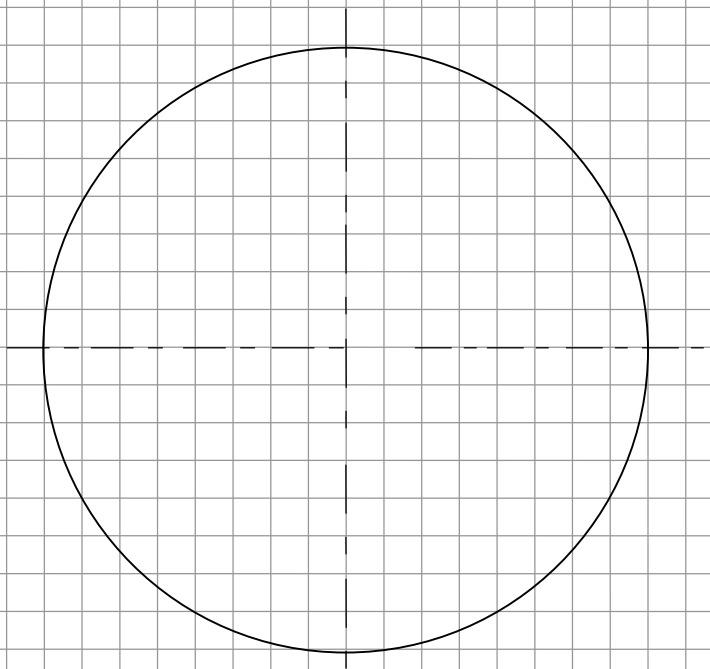
Appropriate drawings with dimensions

| | | |
|---|---|---|
| **Elevation** | **10 marks** | |
| | (Top circle | 2 marks) |
| | (Sloping lines | 2 x 2 marks) |
| | (Top line | 2 marks) |
| | (Small rectangle | 2 marks) |
| **Plan** | **4 marks** | |
| | (Small circle | 2 marks) |
| | (Rectangle | 2 marks) |
| **Dimensions** | **3 x 1 marks** | |
| **Proportion** | **4 marks** | |
| **Quality** | **4 marks** | |

Note: Each grid space is 5mm




Complete the Elevation



Complete the Plan

*Section 1* **Q3.** **20 marks**

(a) Three common safety features seen in an Engineering room are shown. Name **two** safety features and give a reason for each. One example is already completed.

2 x (1 + 2) marks



| Safety feature | Reason |
|---|---|
| Example: Fire Alarm. | To indicate by an alarm bell, to all people in the building that a fire has broken out. |
| 1. Fire extinguisher | To extinguish fire |
| | |
| 2. First aid box | To store medical supplies |

(b) The diagram shows a drilling machine in use. State **two** safety precautions that are being observed. 1 + 1 mark

1. Goggles being worn while working

2. No loose clothing

(c) When using oxy acetylene equipment identify **any two** dangers and describe the safety precautions that should be observed in each case. 2 + 1 mark

Danger Leaking gas

Safety precaution Keep hoses in good condition

Danger Cylinders could fall

Safety precaution Keep them strapped securely

(d) State **two** safety precautions that should be observed when working with hot metal in a forge. 1 + 1 mark

Safety precaution 1 Wear gloves

Safety precaution 2 Only one person at the anvil

(e) What does the safety symbol shown indicate and where would it be used? 2 + 2 marks

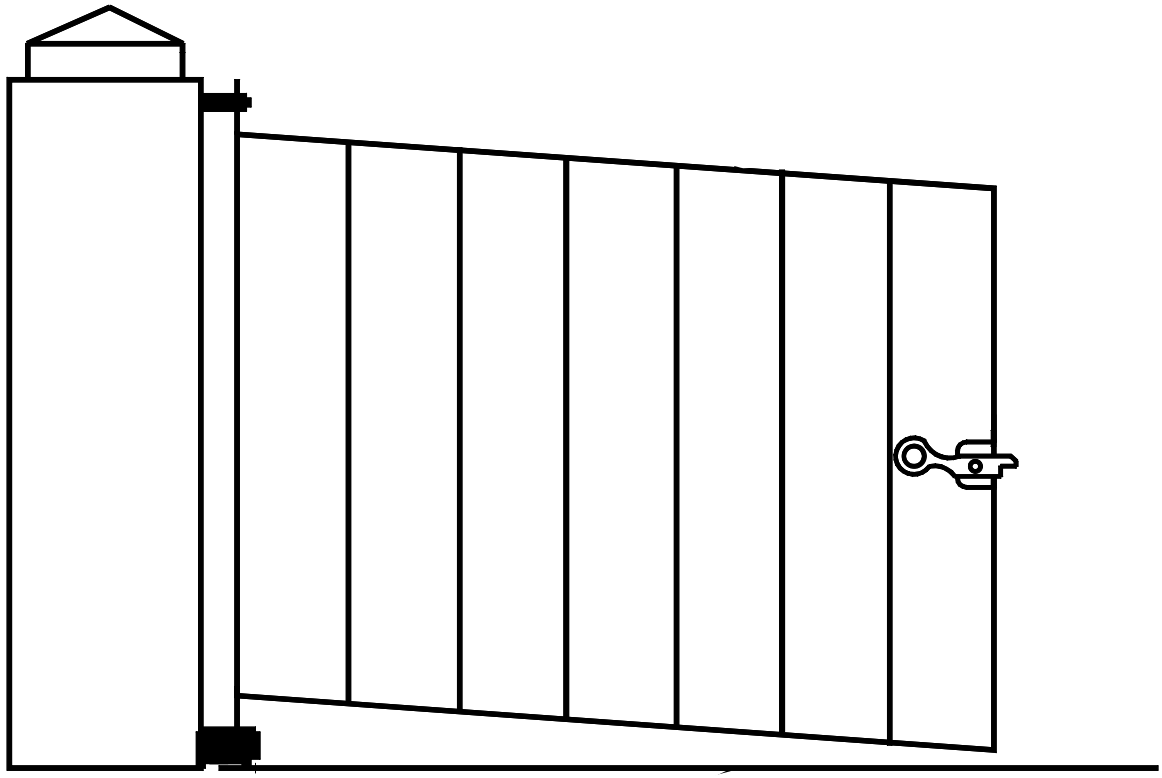
Symbol indicates Direction of exit

Used Used over exit door or on exit stairway

## *Section 2 (150 Marks)*
**Answer any three questions**

*Section 2* **Q4.** **50 marks**

An entrance gate, which has sagged due to poor design, is shown below. It is made from steel bars that are welded together and is hung on a concrete pier.



(a) Outline **one** major design flaw with this gate. 10 marks

Design flaw No diagonal support /strut on this gate

(b) (1) In the space provided, sketch a design modification for the given gate which will prevent it sagging.

(2) Suggest an additional design feature that will enhance the appearance of the gate.

**Appropriate sketch**

**Showing gate with diagonal support** **15 marks**

**Insert a wrought iron scroll** **5 marks**

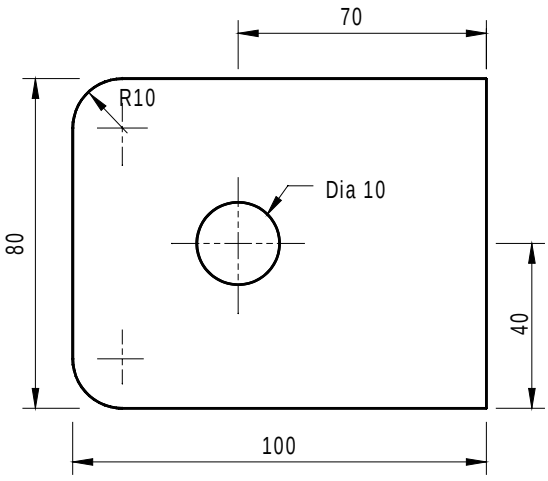
(c) You are required to mark out a hole of 10 mm diameter on the latch support bracket below.

(1) List **three** marking out tools you would use.

1 Rule 4 marks

2 Scriber 4 marks

3 Try square 4 marks




(2) List **two** safety precautions that should be observed when drilling the hole.

1 Wear goggles 4 marks

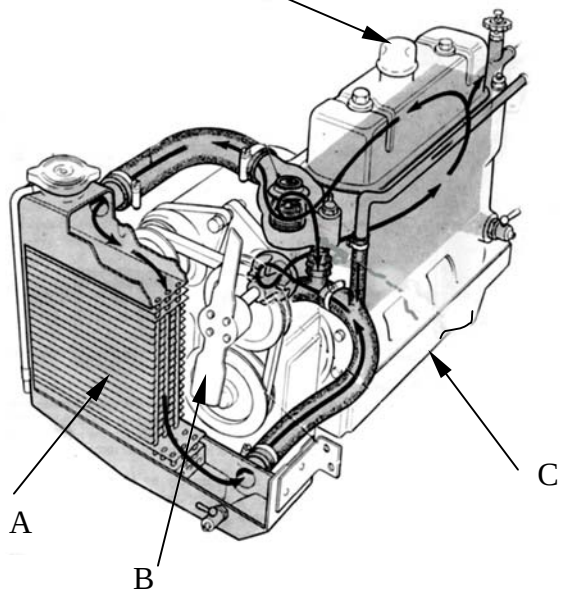
2 Drill pilot hole 4 marks

*Section 2* **Q5.** **50 marks**

(a) Name and state the function of **any three** parts of the engine shown in the diagram.

3 x (2 + 2) marks

| Part | Name | Function |
|---|---|---|
| A | Radiator | Cool engine |
| B | Fan | Draw air through radiator |
| C | Sump | To hold oil |
| D | Oil cap | To seal opening for oil |




(b) Explain the function of **any four** of the following components. *(use sketches as appropriate).*

4 x 5 marks

Inlet valve To allow fuel into engine

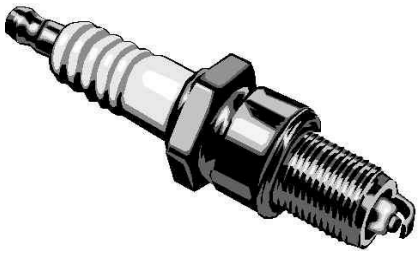
Spark plug To ignite mixture

Air filter To clean air

Carburettor To mix air and petrol

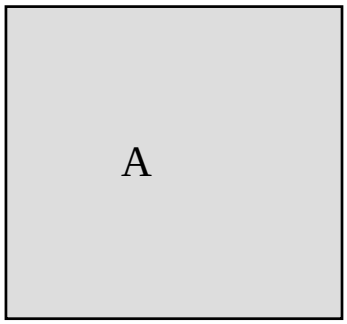
Alternator To charge battery

(c) When servicing a motor car, you are required to change the spark plugs and oil filter. Describe **three** steps necessary to complete each procedure safely. *(use sketches as appropriate).*



| Changing the spark plugs | Changing the oil filter |
|---|---|
| Step 1 Unclip the lead 3 marks | Step 1 Drain oil from sump 3 marks |
| Step 2 Unscrew plug 3 marks | Step 2 Unscrew filter 3 marks |
| Step 3 Insert new plugs 3 marks | Step 3 Insert new filter 3 marks |

(a) A copper bowl as shown, is made from the sheet 'A'. Describe briefly **any four** stages used to transform the shape from the original square sheet into the finished bowl. *(use sketches as appropriate).*




Square sheet of copper

Bowl

Stage 1 Mark out circle 6 marks

Stage 2 Cut copper to circular shape 6 marks

Stage 3 Anneal copper 6 marks

Stage 4 Using sandbag and mallet shape bowl - annealing regularly 6 marks

**Appropriate sketches**

(b) A candleholder made from mild steel scrolls is shown below. Describe **four** stages you would use to make a single scroll. *(use sketches as appropriate).*

1 Mark steel to required length 5 marks

2 Cut steel and file off excess burr 5 marks

3 Using jig, bend to required shape 5 marks

4 Remove from jig and clean 5 marks

(c) Describe **two** safety precautions you would take if the scrolls are made by hot forging.

1 Wear gloves 3 marks

2 Wear goggles 3 goggles

# Systems Module

(**Any two** topics comprise a full module)

**Answer any two from the following five topics.**

Topic (a) – Computer Aided Design (CAD)

Topic (b) – Electricity

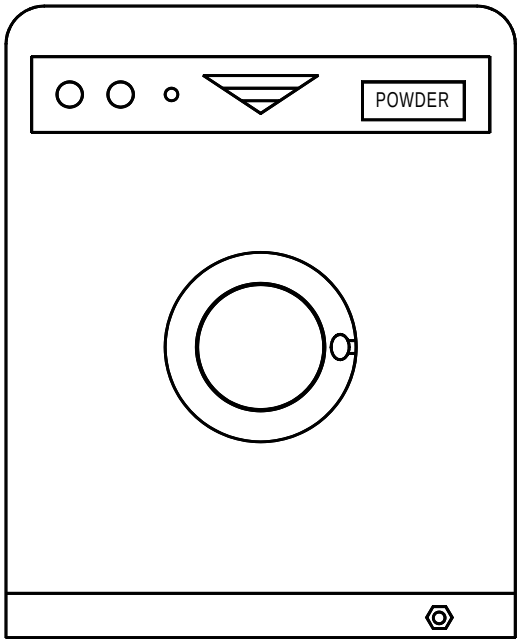
Topic (c) – Electronics

Topic (d) – Mechanisms

Topic (e) – Pneumatics

(a) A drawing of the front of a washing machine is shown. List any **five** CAD commands necessary to produce the drawing.

5 x 3 marks




1 Line

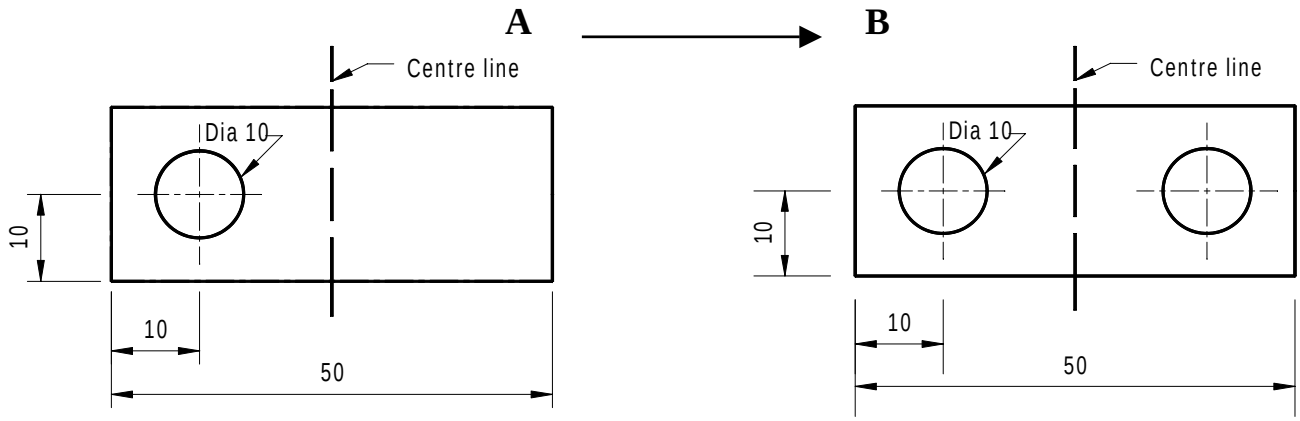
2 Rectangle

3 Fillet

4 Ellipse

5 Insert text

(b) Given the drawing at 'A', state the command and explain the procedure used to complete the drawing shown at 'B' below. 2 x 5 marks




Command Mirror

Procedure
Select left circle
Select mirror
Select centreline
Select right hand position

*Section 2* **Q7 (b) Electricity** **25 marks**

(a) Explain the function of **any three** of the electrical components shown below. 3 x 5 marks

Earth rod

ESB Meter


Fuse

Consumer board

(1) Earth rod Used to make circuit to ground during electrical fault

(2) ESB meter To measure usage of electrical current

(3) Fuse Safety device to break circuit if a fault occurs

(4) Consumer board Used to distribute electrical power to circuits

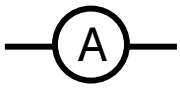
(b) Water, oil and wind are used to generate electricity in Ireland. 10 marks
Explain briefly how **one** of these is used to generate electricity.

**Water** : Water flows through a turbine which turns a generator to make electricity

*Section 2* **Q7 (c) Electronics** **25 marks**

(a) Name and give a use for **any four** of the circuit symbols and components shown.

4 x (2 + 2) marks

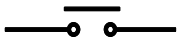


Name Ammeter

Use To measure current

Name Variable resistor

Use To control current flow



Name Push button switch

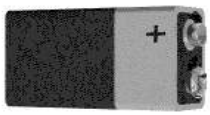
Use To make circuit

Name LED

Use To indicate power on

Name Speaker

Use To generate sound



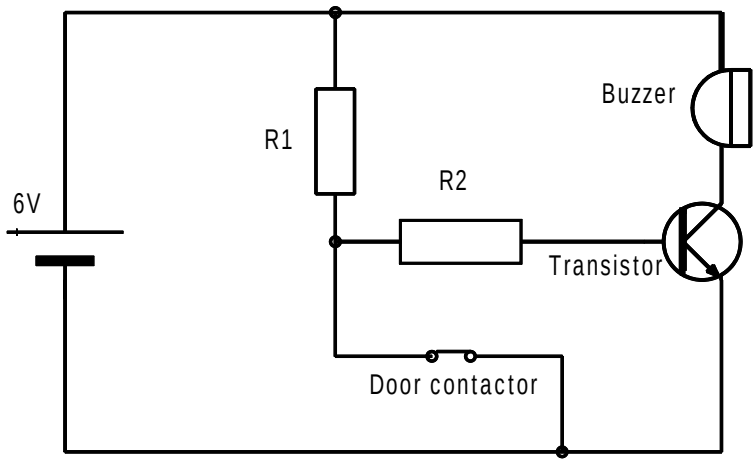
Name Battery

Use To store DC current

(b) A basic circuit for an alarm system is shown below. 9 marks

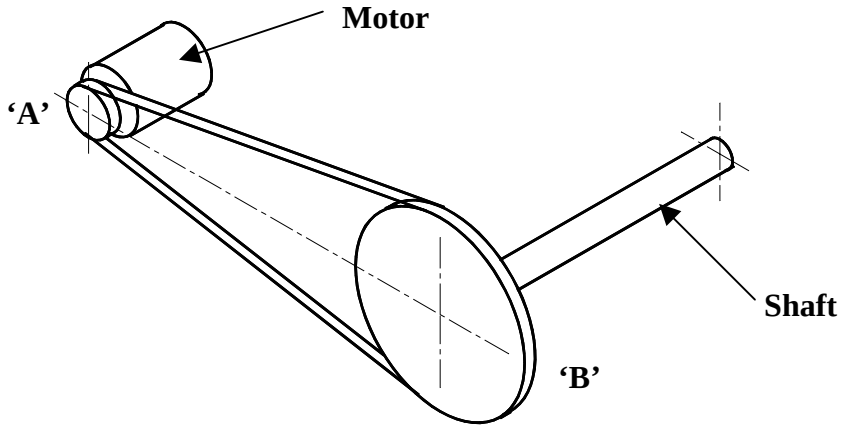
Explain how the circuit works when the door contactor is open.

The door opens and breaks the circuit. The current flows through the base of the transistor. This switches on the transistor closing the circuit and allowing the buzzer to activate



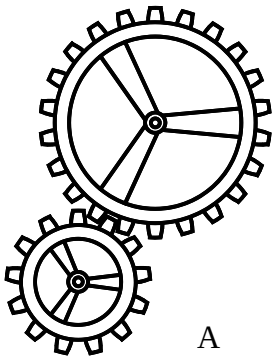
*Section 2* **Q7 (d) Mechanisms** **25 marks**

(a) The motor shown rotates at 1000 RPM and pulley 'A' is 8 mm in diameter. If pulley 'B' has a diameter of 40 mm calculate its RPM.



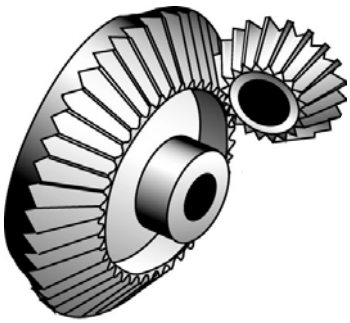

RPM **Calculation:**
1000 x 8 / 40 = 200 RPM 13 marks

(b) Identify **any two** of the mechanisms A, B or C and state where they are used. 2 x (3 + 3) marks



A

B



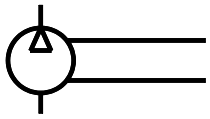
C

| | Name | Where used |
|---|---|---|
| Mechanism A | Gear train | Drilling machine |
| Mechanism B | Sprockets and chain | Car engine |
| Mechanism C | Bevel gears | Hand drill |

(a) For any two of the following pneumatic symbols, name the symbol and give a use for the component. 2 x (4 + 2) marks

Name Pressure gauge

Use Indicate pressure



Name Compressor

Use To generate air supply

Name Restrictor valve

Use Regulate air flow

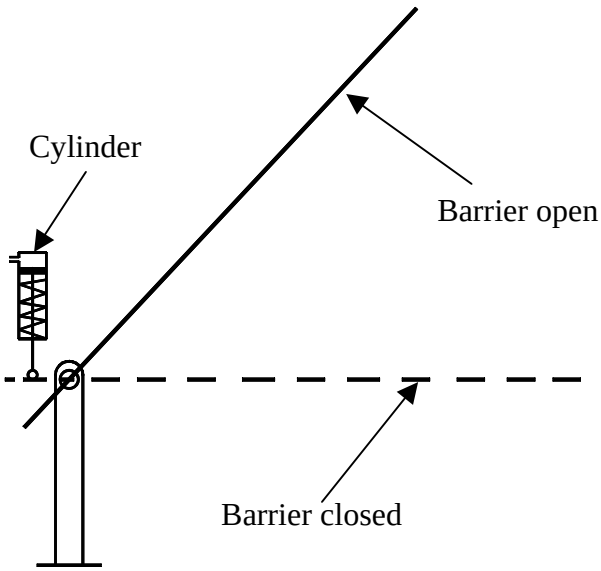
(b) A common type of pneumatic cylinder, used to open and close a barrier, is shown below. 3 + 4 marks

(1) Name the type of cylinder shown.

Single acting cylinder

(2) Explain how this cylinder operates the barrier.

Air flows into cylinder which, pushes down the ram thus lifting the barrier.




(c) Give **two** safety precautions that must be observed when using compressed air. 2 x 3 marks

1 Use low pressure

2 Make sure that there are no loose pipes / all connections are checked regularly