

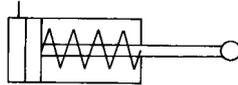
SECTION B – 35 MARKS (continued)

| |
|-------|
| MARKS |
|-------|

(i) Any one:

- (i) **Feeler gauge:** Used to estimate, by sense of touch, the clearance between two separate components by inserting different blades or combination of blades until the thickness is found that will just go between the surfaces. Spark plug, car tappets.
- (ii) **Single acting pneumatic cylinder:** A common pneumatic device used to produce a reciprocating output motion. When air enters the cylinder it forces the piston to move on an outward stroke.

| |
|--|
| Good clear description Award 12(11) marks Total (12,11) |
|--|



- (iii) **L.D.R.:** An electrical component, whose resistance decreases with light.

(j) Any two

- (i) **CD-ROM:** Compact Disk - Read Only Memory. Portable storage device, which stores vast quantities of information.
- (ii) **Graphics Card:** A printed circuit board that plugs into a computer to give it display capabilities and to allow graphical output.
- (iii) **Software:** The set of instructions that enables computer systems to process information i.e word processing, desktop publishing, computer aided drawing, games etc.
- (iv) **Formatting:** The process of preparing a disk electronically before it can be used on a computer.

| |
|--|
| Good clear description Award 6+6(5) Marks Total (12,11) |
|--|

- (k) (i) The ability of a metal to be drawn out long and fine.
- (ii) Copper is a ductile metal.

| |
|---|
| Definition Award 6 Example Award 6(5) Total (12,11) |
|---|

(l) Any two

(i) **Knurling:** The operation of impressing serrations on articles to enable them to be gripped securely.

(ii) **Enamelling:** A protective or decorative coating of powdered glass (vitreous enamel) fused on to the surface of a metal by firing using a blow torch or kiln.

Good clear description
Award 6 + 6(5)
Total (12,11)

(iii) **Conductor:** A material, which will allow electricity or heat to flow through.

(iv) **Reaming:** Enlarging an existing hole to make it round, smooth and accurate in size.

(m) (i) Center drill/Slocomb drill. (ii) Countersink drill.

For names
Award 6 +6(5)
Total (12,11)

QUESTION NO.2

Total 45 Marks

(a) (i) Cupola produces: Cast Iron
(ii) Blast Furnace produces: Pig Iron
(iii) Electrical Arc Furnace produces: Steel
(iv) Basic Oxygen Furnace produces: Steel

Name metals
Award 4 @ 3 Marks
Total (12)

(b) Metals that come from Iron and are prone to corrosion are ferrous metals. **Example** Steel and its alloys.

Difference
Award 2 @ 4 Marks
Example
2 @ 2 Marks
Total (12)

Metals that do not come from Iron and have a high resistance to corrosion are non-ferrous metals. **Example** Copper, Brass, Lead.

(c) (i) Bit of a soldering Iron: Copper
(ii) TV aerial: Aluminium
(iii) Scriber: High Carbon Steel

Materials
Award 3 @ 4 Marks
Total (12)

(d) **One application only:**

Lead can be alloyed with Tin to produce Solder.
Lead can be used to produce a protective shielding against radiation

Application
Award 1 @ 9 Marks
Total (9)

QUESTION NO. 3

Total 45 Marks

Name
Award 3 @ 6 Marks
Total (18)

- (a) (i) Hardening (ii) Annealing (iii) Case Hardening

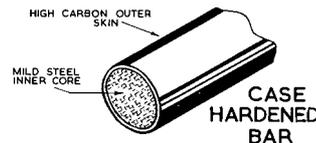
(b) **Carburising process:**

Low carbon steel does not contain sufficient carbon to enable it to be hardened in the normal way. Steel with a small percentage of carbon (mild steel) is first ‘carburised’

This is a process of increasing the carbon content of the outer surface by placing the component in a substance rich in carbon. The component is heated to 950 degrees centigrade allowing the carbon to penetrate the surface of the component. The component will now have an outer skin rich carbon.

Good description
Award 9 Marks
Total (9)

The component is then heated 850 degrees centigrade and quenched in water, this produces a hard outer skin.



- (c) Heating copper to a dull red color and allowing to cool slowly in air or quench in water will render the copper soft i.e. annealed.

Good description
Award 6 Marks
Total (6)

- (d) (i) If a metal is hard it will resist being scratched, cut or worn. It will also be very brittle and can break easily.

- (ii) Work hardening occurs when a metal is cold worked. It becomes hard and brittle at the point where the cold-working is. Some metals are more prone to work hardening than others, copper and aluminium being typical examples where hardness values can be increased by cold working.

Good description
Award 7 + 5 Marks
Total (12)

OR

The circuit shows two 3/2 port valves and a double acting cylinder. The System produces linear motion of the piston by air entering one side of the piston and exhausting on the other side.

Use of such a circuit:

- (i) Opening and closing a door.
(ii) Clamping device.

Good description
Award 10 + 2 Marks
Total (12)

QUESTION NO. 4

Total 45 Marks

- (a) (i) A Carburising flame: Excess acetylene is supplied to the neutral flame.
- (iii) An Oxidizing flame: Additional oxygen is supplied to the neutral flame.
- (iv) A Neutral flame: Equal quantities of oxygen and acetylene.

Identify three
Award 3 @ 6 Marks
Total (18)

- (b) To protect from oxides when arc welding a flux-coated electrode is used.

- This provides a shield of gas against atmospheric contamination of the arc and the weld pool.
- Provides a slag to protect the weld metal from oxidation during cooling.

Good description
Award 5 Marks
Total (5)

- (c) (i) Light gauge aluminium : Pop riveting
(ii) Tinplate: Soldering
(iii) Mild Steel plate: Spot Welding/Brazing

Name process
Award 3 @ 2 Marks
Total (6)

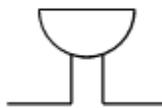
- (d) (i) Ensure correct protective equipment is worn.
(iii) Work in a well-ventilated area.

Two precautions
Award 8+8 Marks
Total (16)

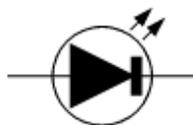
OR

- (d)

(i) **Buzzer:**



(ii) **LED:**



(iii) **Motor:**



Sketch three **16 Marks**
Sketch two **10 Marks**
Sketch one **6 Marks**
Total (16)

QUESTION NO. 5

Total 45 Marks

(a) (i) **Thermosetting:**

Thermosetting plastics are three dimensional in structure with strong cross-links between molecules. They are therefore rigid and hard, they cannot be reset once they have hardened in the mould.

Good description
Award 7 + 7 Marks
Total (14)

(ii) **Thermoplastic:**

Thermoplastics are linear chain type polymers and are relatively soft and flexible, they melt easily and can be repeatedly softened and remoulded.

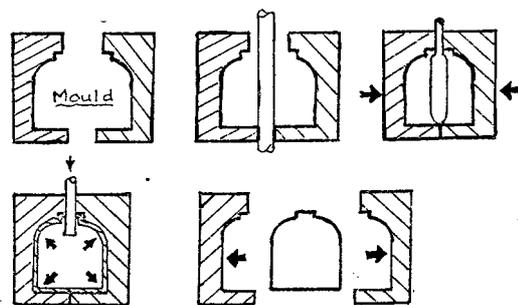
(b) **Any three methods of manufacture :**

- Injection Moulding
- Compression Moulding
- Extrusion
- Vacuum Forming
- Blow Moulding etc.

Name processes
Award 3 @ 5 Marks
Total (15)

(c) (i) **Blow Moulding:**

In blow moulding a heated thermoplastic tube called a parison is extruded between the two halves of a split mould. The mould closes around the parison and air is blown into it forcing it out against the wall of the mould. The component is allowed to cool before being removed from the opened mould.



BLOW MOULDING

Using this process thermoplastic materials like polythene can be moulded into **bottles** and **drums**.

Process
Award 10
Article
Award 2
Total (12)

(d) **Insulation:** Polystyrene - Used to provide thermal insulation.

Bakelite (Phenolic Resin), Nylon, Polyethylene -
Used to provide electrical insulation

Name
Award 1 @ 4 Marks
Total (4)

QUESTION NO. 6

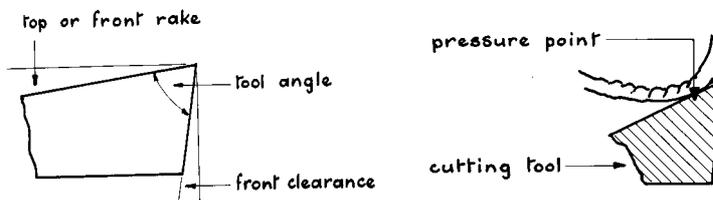
Total 45 Marks

- (a) (i) Parallel turning
(ii) Parting-off
(iii) Knurling

Identify
Award 3 @ 6 Marks
Total (18)

- (b) (i) **Clearance angle:** This ensures that only the cutting edge of the tool comes into contact with the work. Without clearance the tool would just rub against the work without cutting.

- (ii) **Rake angle:** This facilitates the removal of the chip being cut.

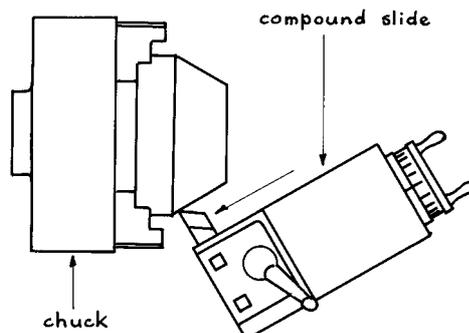


Good description
Award 5 + 4 Marks
Total (9)

- (c) (a) **Methods of taper turning:**
(i) Form turning (using the tool angle).
(ii) Setting the angle on the compound slide/top slide.
(iii) Offsetting the tailstock.
(iv) Using a taper turning attachment.

Methods
Award 3 @ 2 Marks
Total (6)

- (b) **Setting the angle on the top slide:**



Cutting a taper with the compound slide set at an angle

Good description
Award 6 + 6 Marks
Total (12)

Here the compound slide is swiveled on its base, locked at the required angle and the tool fed by hand using the slide handle.

QUESTION NO. 7**Total 45 Marks**

- (a) (i) Nominal Diameter - 80mm
(ii) Upper Limit - $80 + 0.05 = 80.05\text{mm}$
(iii) Lower Limit- $80 - 0.05 = 79.95\text{mm}$
(iv) Tolerance- $80.05 - 79.95 = 0.1\text{mm}$

Calculations
Award 4 @ 5 Marks
Total (20)

- (b) (i) **Clearance fit:**
A clearance fit results in the assembly of a shaft and hole where the upper limit of the shaft is smaller than the lower limit of the hole.

Good description
Award 7 + 6 Marks
Total (13)

- (ii) **Interference fit:**
An interference fit results where the lower limit on the shaft is always greater than the upper limit on the hole.

- (c) **Plug gauge:**
A plug gauge is used to determine if a hole is within its specified limits. If a hole is within its specified limits, it will allow the 'GO' end of the gauge to pass through it but it will not allow the 'NO GO' end to pass through it.

Name
Award 2 @ 4 Marks
Function
Award 2 @ 2 Marks
Total (12)

- Gap gauge:**
A gap gauge is used to determine if a shaft is within its specified limits. If a shaft is within its specified limits, it will fit into the 'GO' opening and it will not fit into the 'NO GO' opening on a gap gauge.

OR

- (c) (i) The circuit shown could be used as a continuity tester or a moisture/water level alarm.
(ii) The purpose of the transistor is to act as an electronic switch, to allow battery current to flow through the buzzer when continuity or moisture/water is detected at the probes.

Function
Award 8 Marks
Purpose
Award 4 Marks
Total (12)

