30.16 METALWORK (445)

30.16.1 Metalwork Paper 1 (445/1)

1. (a)
   - To protect eyes.
   - To protect feet.
   - To protect hands.
   - To protect clothes . ***(4 × ½ marks)***

   (b) ***Public***: are manufacturing industries which are either partially or wholly owned by the government.
   Private: are industries owned by individuals (sole proprietor) or a group of individuals.
   (2 marks)

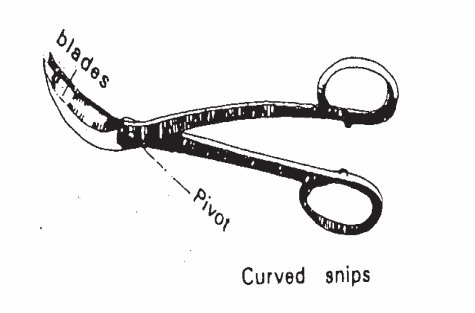
2. (a)
   - Length.
   - Cut.
   - Shape. (cross section)
   - Grade. ***(3 × ½ marks)***

   (b) (i) ***Cross cut***
   - Cutting square holes.
   - Making slots.
   - Making key ways.
   - Making channels.

   (ii) ***Half round***
   - Filing flat surfaces.
   - Filing concave surfaces. ***(Any 4 × ½ marks)***

3. (a)
   - Drawing circles and radii where ordinary compasses are too small.
   - Bisecting long lines.
   - Transfer of measurements.
   - Marking parallel lines to an edge.
   - Stepping equal distances. ***(Any 4 × ½ marks)***

   (b)



Curved snips

(1 ½ marks)

4. ***Physical*** :-Characteristics of metal which do not influence the strength of metal for example:- Colour, density, conductivity. ***Mechanical***:- Characteristic of metal which influence its strength for example:- Hardness, turfness, brittleness, malleability, elasticity etc. ***(4 marks)***

5. (a)
   (i)

- ***Backfire***:-a condition whereby the flame momentarily recedes back into the tip before being expelled with a loud sound.
- ***Causes:-***
  - Weak acetylene frame.
  - Leaks.
  - Overheated torch.
  - Dirty tip.
  - Tip coming into contact with molten pool. ***(Any 2× ½=1 marks)***

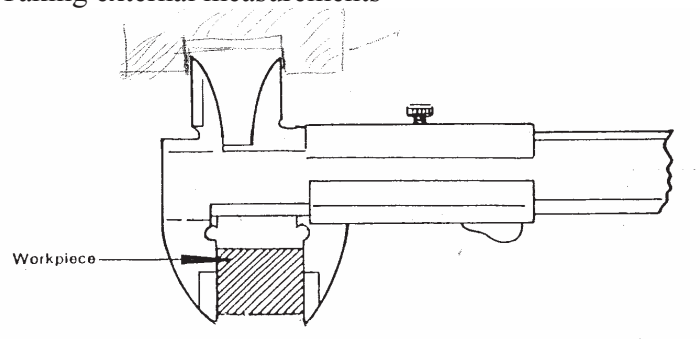
(ii)

- ***Flashback***:- the torch stays lit instead of expelling the frame. It tends to travel in the torch body.

- ***Causes***:-
  - Improper pressures.
  - Faulty mixing chamber.
  - Overheating of torch.
  - Faulty tip.
  - Kinked hoses. ***(Any 2× ½=1 marks)***

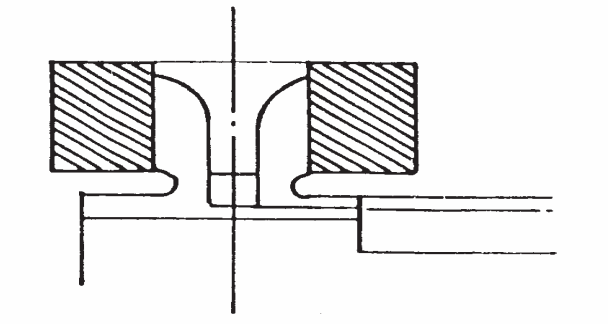
6.

(i) Taking external measurements



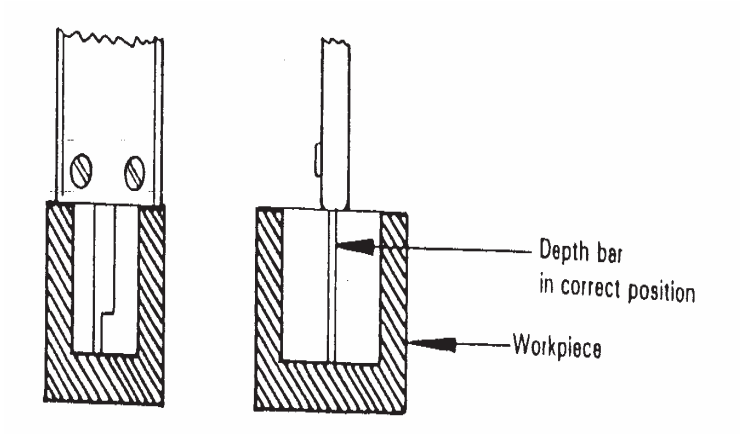
(1 ½ marks)

(ii) Taking internal measurements



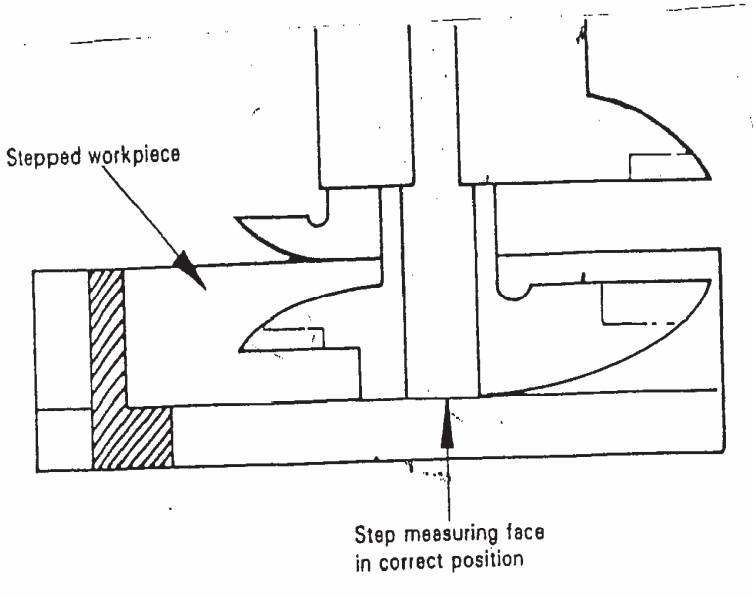
(1 ½ marks)

(iii) Taking depth measurements



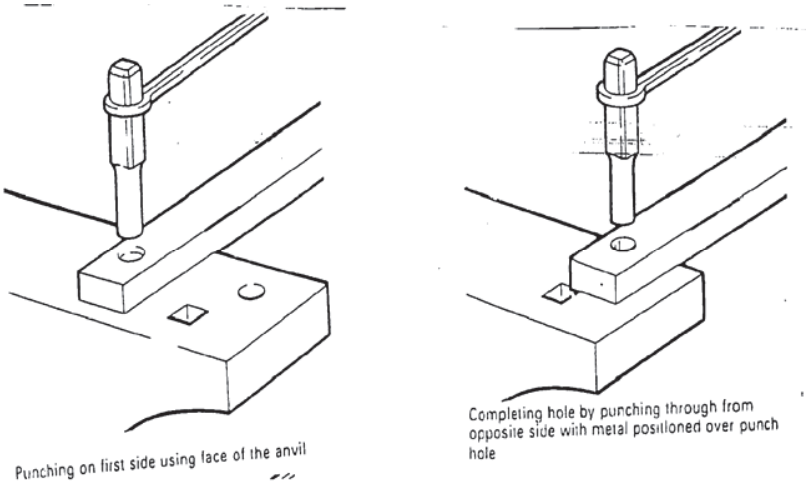
(1 ½ marks)

(iv) Taking stepped measurements



(1 ½ marks)

7.



(3 marks)

8. (a)

- Both use - different working temperature.
  - different filler rod.
- Soldering - different flux.
- Brazed joint is stronger than soldered. ***(2 marks)***

(b)

- By bending and flattening.
- By wire edging (bend over a wire and retain it).
- By heading (bend over wire and remove it). ***(3 marks)***

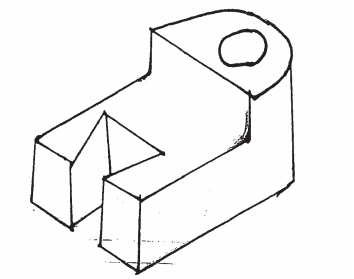
9. (a)

- Pop rivet faster to install than snap rivet.
- Pop rivet is done from only one side. ***(2 marks)***

(b)

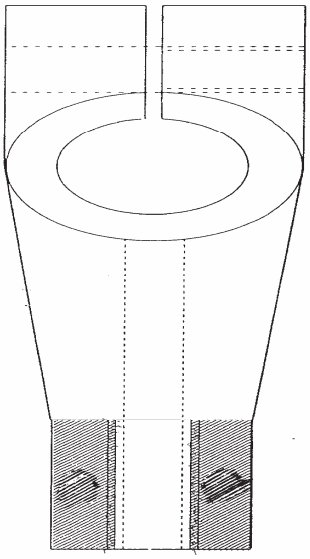
- Protects surfaces from damages.
- Provides additional beauty.
- Protection from corrosion/rusting. ***(1 ½ marks)***

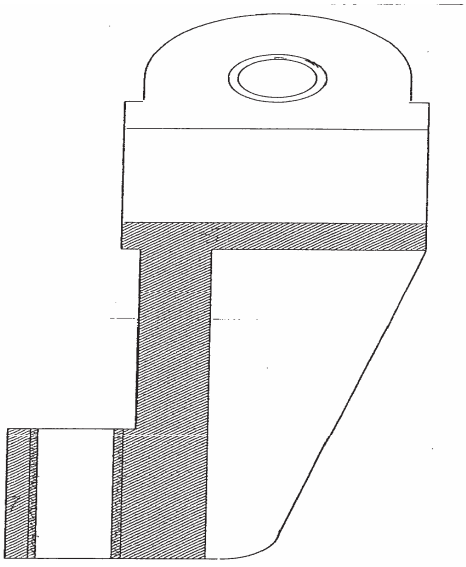
10.



(5 marks)

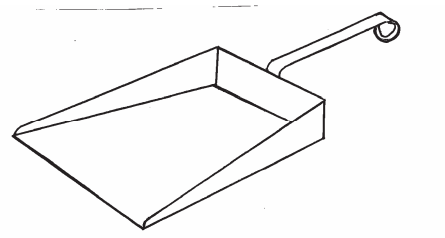
11.





(15 marks)

12. (a)



(5 marks)

(b) (i)

- Mark out the development as shown in the diagram.
- Cut and file to shape and size.
- Using a mallet and folding bars, bend the two sides.
- Bend the back over the sides
- Bend the flaps.
- Deburr the work piece.

(ii)

- Cut the required length of the flat bar.
- From a loop (eye) on one end of the handle.
- Bend the second end to correct shape and angle.
- Deburr the handle.

(iii)

- Clean the surfaces to be braced.
- Align the body and handle and lamp together.
- Open the cylinders and set the gas to correct pressure.
- Light and set the torch to correct flame.
- Heat the brazing rod and dip it into flux.
- Heat the joint to melting point of the rod.
- Braze the joint.
- Put off the flame.
- Clean the joint to remove excess flux.
- Shut off the cylinders and release the system pressure. ***(10 marks)***

13. (a) (i) Alloy of tin and lead: Should have:

- Low melting temperature.
- Low surface tension.
- High capillarity resistance to corrosion.

(ii) Cast iron: Should be:

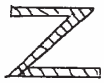
- Self lubricating.
- Hard surface.
- Easy to make.

(iii) High speed steel: Should be:

- Resistance to rust and wear.
- Retain hardness even at high temperature.

- Hard. ***(4½ marks)***

(b)

(i)  For roofwork and window frames

(ii)  Steel structures and frames

(iii)  Furniture, fences, gates

(3×1½ marks)

(c)

- ***Bluing***:- A method of finishing metal articles using heat to achieve a corrosion resistant surface. Done by heating until colour changes to blue then dip the work into light oil and allow to cool. ***(2 marks)***
- ***Lacquering***:- A process of metal finishing using lacquer for preservation and beauty. The types of lacquer used include hot, gum cellulose and synthetic and is applied using a brush, dipping or spraying. ***(2 marks)***
- ***Planishing***:- Is a process of finishing by making even decorative dents on sheets metal using a planishing hammer and stake. The process includes annealing, picking buffing and cleaning. ***(2 marks)***

14. (a) (i) Shank diameter
Ø = 1½ thickness = $^{3}/_{2} \times 4 = 6$ mm

(ii) Shank length = 2 × thickness + 1½Ø = (2 × 4) + (⅔ × 6) = 8 + 9 = 17

(iii) Edge distance A = 1½D = $^{3}/_{2} \times 6 = 9$

(iv) pitch distance = 3D = 3 × 6 =18 ***(6½ marks)***

(b)

- Strength of the joint.
- Thickness of the joint.
- Appearance.
- Where used. ***(1½ marks)***

(c)

- Mark the holes and drill one hole on cover plate.
- Drill a hole on one of the plates to be joined.
- Debur the plates.
- Cut the rivet to correct size.
- Align the pieces and insert rivet.
- Close the plates using rivet set.
- Spread the tail of the rivet shank.
- Form the head with ball pen.

- Finish with rivet snap.
- Drill the second hole and rivet.
- Align the second plate.
- Drill the holes for second plate.
- Rivet the second plate.
- Finish. ***(14×½ marks)***

15. (a)

- Cold forging procedures better finish than hot forging.
- Cold forging work hardens and leaves the work stressed.
- Cold forging requires ductile material and of small cross-section unlike hot forging.

(3 marks)

(b) (i)

Eye: π D where D=20+3+3=35

π 35=$\frac{22}{7}$ ×35=110

Straight part: 120-$\left(\frac{22}{7}+6\right)$=102-20.5=99.5

Total length = 110+99.5=209.5 mm ***(3 marks)***

(ii)

- Mark the required for the eye.
- Bend the rod to 90°.
- Form the eye on anvil by start, further and closing.
- Hammer the eye on the anvil flatten. ***(3 marks)***

(iii)

- Hold the work piece in the vice.
- Chamfer the end to be threaded.
- Select the correct die M6.
- Fix the die in the die stock.
- Adjust the die to maximum opening.
- Fit the die square at the end of the bar.
- Apply cutting the thread.
- Continue cutting and reversing to beak the chips.
- Remove the die.
- Adjust the depth of the cut.
- Repeat thread cutting until the right depth is achieved. ***(6 marks)***