**30.16 METALWORK (445)**

* + 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)

  ***(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.

1. Taking external measurements

 ***(1 ½ marks)***

1. Taking internal measurements

 ***(1 ½ marks)***

1. Taking depth measurements

 ***(1 ½ marks)***

1. 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)

  ***(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 × 4 = 6 mm

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

 (iii) Edge distance A = 1½D = 3/2 × 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: D where D=20+3+3=35

 35=×35=110

 Straight part: 120-=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)***