

01. Explain the following terms: **(5marks)**

- a) Inert
- b) Gas
- c) Inert gas
- d) Tungsten
- e) Punching

02. Classify the following metals into ferrous and nonferrous metals: **(5marks)**

- a) Stain less steel
- b) Wrought iron
- c) Cast iron
- d) Tin
- e) Brass
- f) Bronze
- g) Lead
- h) Alloy steel
- i) Galvanized metal
- j) Aluminium

Ferrous metals	Nonferrous metals

03. Explain the following welding processes **(5marks)**

- a. TIG welding process
- b. Tack welding

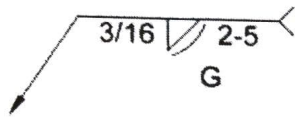
04. What is the use of the following in welding? **(5marks)**

- a) TIG hoses
- b) Collet
- c) TIG welding pedal
- d) flow metal.

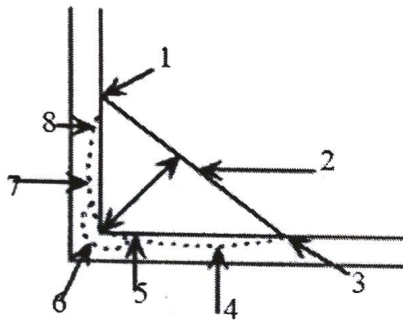
05. State any five (5) advantages of TIG Welding. **(5marks)**

06. Differentiate pressure regulator from flowmeter. **(5marks)**

07. Describe in details the following welding symbols
(all dimensions are in inch). **(5marks)**



08. a) Fill the parts of the following fillet weld. **(4marks)**



b) Enumerate any two (2) functions of shielding gas. **(1mark)**

09. What is Flux Cored arc welding? **(5marks)**

10. Enumerate five (5) advantages of gas cutting process. **(5marks)**

11. Give at least five (5) advantages of Plasma Cutting. **(5marks)**

12. a) What do the following terms stand for? **(2marks)**

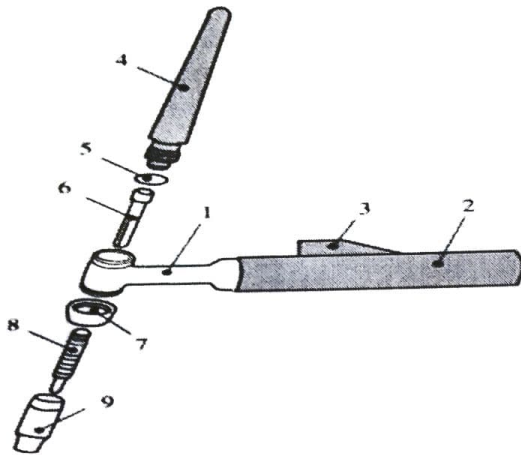
i. MIG

ii. MAG

b) Give the types of MIG/MAG Welding machines. **(3marks)**

Section II: Attempt any four (4) questions out of Six (6) (40 marks)

13. Complete the following Tig torch sketch: (10marks)



14. Describe the following types of welding joints: (10marks)

- a. Butt joint
- b. Corner joints
- c. Edge joint
- d. Lap joint
- e. Tee joint

15. (a) Write down AWS classification designator of FCAW cored carbon steel wire electrode and give one example. (5marks)

(b) State FCAW electrode manufacturing methods. (1mark)

(c) Differentiate the types of FCAW welding. (4marks)

16. Explain the types of welding current used for TIG Welding. (10marks)

17. a) State two (2) defects in TIG welding.

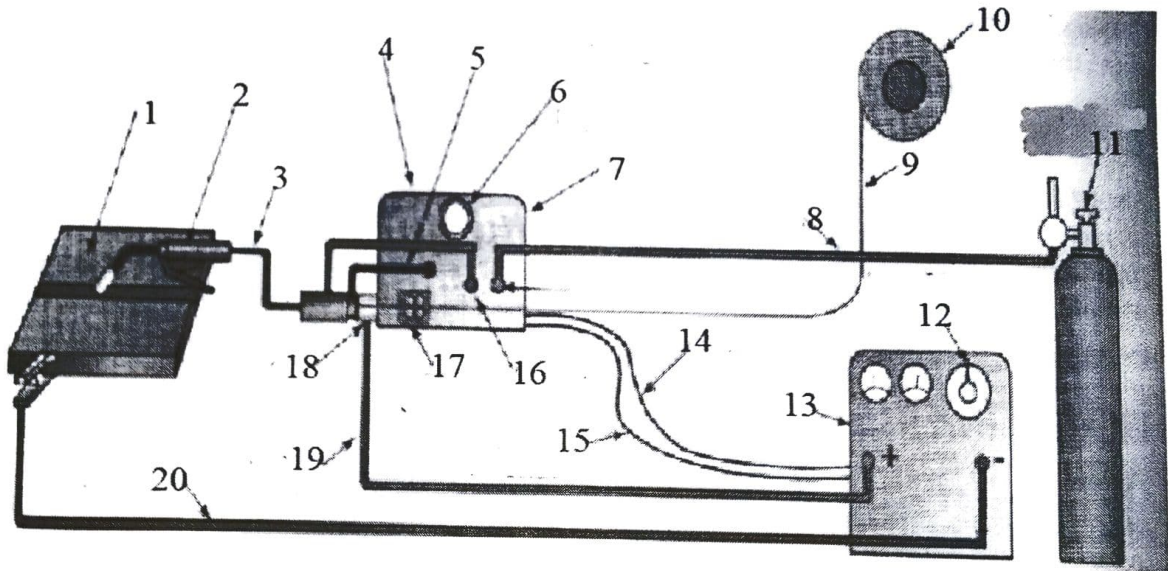
(2marks)

b) Mention the causes of defects stated in (a) and then propose the remedies.

(8marks)

18. Name the parts of the following installation equipment.

(10marks)



SECTION A

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Q1. a) Inert: Lacking the ability or strength to move 1 mark

b) Gas: a substance or matter in a state in which it will expand freely to fill the whole of a container, having no fixed shape (unlike a solid) and no fixed volume (unlike a liquid) 1 mark

c) Inert gas: is a gas that has extremely low reactivity with other substances. The noble gases are helium, argon, neon, xenon. 1 mark

d) Tungsten: is a rare metal found naturally on earth almost exclusively combined with other elements in chemical compounds rather than alone.

It was identified as new element in 1781 and first isolated as a metal in 1783 1 mark

e) Punching: Removing material as scrap - piercing, slotting, perforating 1 mark

Q2	ferrous metals	non ferrous metals
	Cast iron ✓	Aluminium ✓
	- Wrought iron ✓	- Lead ✓
	- Alloy steel ✓	- Tin ✓
		- Brass ✓
		- Bronze ✓
		- Galvanized metal ✓

1/5 marks

1/5 marks

Q3) TIG welding process is a fusion process that generate heat by establishing an arc between a non-consumable tungsten electrode and the base metal. 2.5 marks

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Q4) Tack welding is a real welding, even if the welds are deposited in separate short beads. 2.5 marks

1/5 marks

Qy: a) TIG hoses are used to transport gas from cylinder to the torch. 2 marks

b) Collet: used to fix tungsten electrode. 1 mark

1/5 mark

c) TIG welding pedal: used to regulate the welding current during welding. 1 mark

d) Flowmeter: used to measure the volume or mass of a gas or liquid. 1 mark

Q5. Non-Consumable electrodes - it helps to provide flowless joint because it is not needed to stop for replacing the electrode as in consumable electrode welding. Do not write in this margin

2) No flux is required because inert gas shields molten metal. So no slag and slag inclusion. 1/5 marks

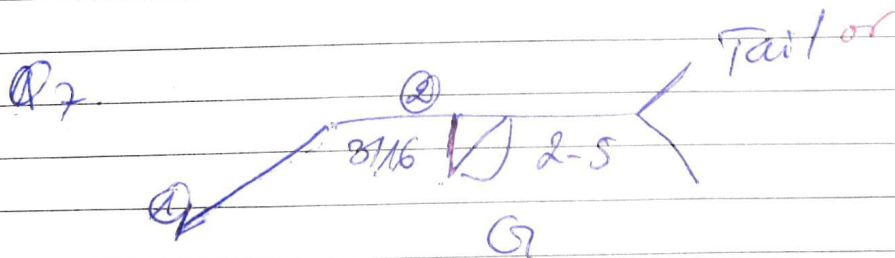
3) High quality and strong welding achieved by TIG. 1 mark

4) cleaner and appealing joint. 1 mark

5) suitable for welding of very thin sections. 1 mark

Q6. pressure regulator : are valves that automatically cut off the flow of a gas or liquid when it is at a certain pressure. 2.5 marks

Flowmeter : is a device used to measure the volume or mass of a gas or liquid. 2.5 marks



- ① arrow of
- ② reference line of

- weld should be made on the opposite side or
- Fillet weld of
- Convex of
- Grinding of of pitch
- 2-5 length of the weld of
- 3/16 size of the weld of

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Q8. a)

- ① Toe of weld or
- ② face of weld or
- ③ root of weld or
- ④ Fusion or
- ⑤ leg 1 or
- ⑥ penetration or

4 marks

- ⑦ Fusion or
- ⑧ Leg 2 or

b) function of shielding gas

1 mark

1 mark

- to protect the arc and weld puddle from the contaminating effects of the atmosphere.
- is accomplished by decomposition of the electrode core.
- displaces air in the arc area.

0.5 for each

Q9. FCW is an arc welding process in which the heat for welding is produced by an arc between a continuously fed tubular electrode wire and the work.

1 mark

Q10. Advantages of gas cutting process

1 for each

- 1) It cuts the metal thickness up to 24mm
- 2) It produces the smooth edge when the automatic gas cutter is used
- 3) It can cut by reading and interpreting the drawing in the case of automatic cutter is used
- 4) It is used for edge preparation by changing the angles.
- 5) It is easier to cut pipes with automatic gas cutter
- 6) It is used to cut circular form on the plates
- 7) It is used where there is no electricity.

1 mark

Q11 Advantages of plasma arc cutting *1 mark for each*

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- 1) It cut any types of electrically conductive metal including aluminium, copper, brass and stainless steel
- 2) It cut carbon steel up to 10 times faster than oxyfuel cutting.
- 3) It produces a small and more precise kerf (width of the cut)
- 4) It has a smaller heat affected zone
- 5) Plasma cutting being primarily a melting process can cut any metal.

1/5 marks

Q12 a) MIG : Metal Inert Gas *1 mark*
ii) MAG : Metal Active Gas *1 mark*

- 6) AC MIG/MAG welding machine *1 mark*
- DC MIG/MAG welding machine *1 mark*
- AC/DC MIG/MAG welding machine *1 mark*

1/5 marks

Q13 SECTION B

- Q13: 1 Torch body *1 mark for each*
2 ~~Shield~~ handle *and add 4 pt*
3 ~~Welder~~ switch
4 back cap
5 Collet
6 Collet body
7 insulator / heat shield
8 Gas nozzle (lead)
9 Nozzle (Ceramic cap)

1/5 marks

Q14 a) Butt joint: it is a joint between two members aligned approximately in the same plane. 2 marks

b) Corner joint: is a joint between two members located approximately at right angles to each other in the form of L shape 2 marks

c) Edge joint: This is formed when two pieces are placed ~~at~~ top each other while also overlapping each other for a certain distance along the edge. 2 marks

d) Lap joint: it is a joint between two overlapping members, none of the strongest types of joints available. 2 marks

e) Tee joint: it is a joint between two members located approximately at right angles to each other in the form of a T 2 marks

/ 10 marks

Q15 a) ^{of 1 1 2} E X X T - X ^{of}
T = Electrode

↳ min tensile strength X 10,000 psi
↳ 10° flat and horizontal
↳ all position

T = Tubular or flux cored

X = Usability performance & impact

Example: E7603
E7602
E7601

/ 5 marks

d) FCAW Electrode manufacturing method producing tubular type cored electrodes on continuous production. Low carbon steel strip passes through forming rolls, which form the strip into a U-shaped cross-section. America

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e) Types of FCAW welding

1) Self-shielded flux-cored electrode: The heat of the arc causes decomposition and some vaporization of the electrode's flux core which partially protects the molten metal. 2 marks

2) Gas-shielded flux-cored electrodes: is similar to SS FCAW but uses protective gas shielding in addition to the flux core. 2 marks

Q16 DC or AC/DC ^{3 marks} power source: for this process the power source is a rectifier unit. This equipment converts the mains alternating current (AC) electric supply to direct current (DC) supply. ^{3 marks} In terms of the welding circuit the torch is connected to the positive (+) terminal available generally at the front of the machine and the welding return lead connected to the available

negative (-) terminal. This means that the power source provides an electricity supply that is connected as DC electrode positive (DC +ve) 3 marks

or AC is suitable for Aluminium and magnetism steel DC is suitable for carbon steels, stainless steels, even other steels. and we consider (+) and (-) straight and reversal polarity 3 marks

10 marks

10 marks

- Q11; - Melt - Through / burn through ~~mark for~~ each
- lack fusion
 - Crater
 - Convex
 - Slag inclusion

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2 marks

4) Melt - Through

- Cause :
- Excessive welding current
 - Too slow of a travel speed
 - Too wide of a root gap

1 for each

2 marks

2 marks

- Remedies :
1. Reducing the welding current
 2. Increasing the travel speed
 3. Reducing the size of the root gap.

Lack of fusion

- causes :
- improper current setting
 - improper welding angle

- Remedies :
- proper current setting
 - proper welding angle

Q.18

of for each

- 1 work
- 2 Gun
- 3 Welding gun cable
- 4 wire feed Controller
- 5 Gun Controller Cable
- 6 Wire Speed feed Control
- 7 wire feed unit
- 8 Gas hose
- 9 wire
- 10 wire reel
- 11 Shielding gas source
- 12 Voltage Controller
- 13 Welding machine
- 14 Control Cable
- 15 wire feed power
- 16 Gas out
- 17 wire feed drive rollers
- 18 power terminal
- 19 welding cable
- 20 work cable.