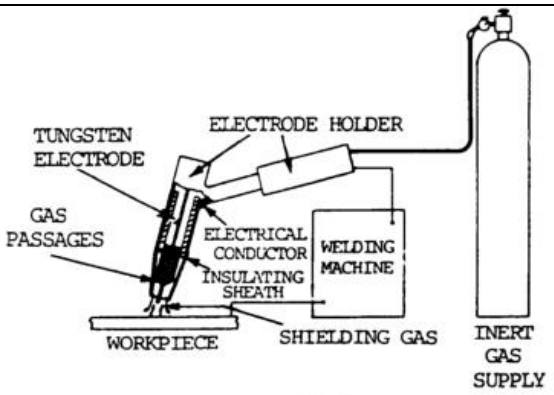
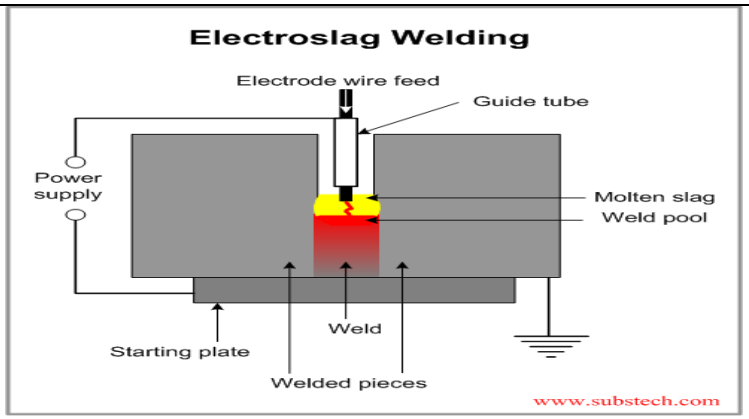
SUMMER – 15 EXAMINATIONS

Subject Code: **17621** **Model Answer**

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more importance. (Not applicable for subject English and Communication Skills)
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

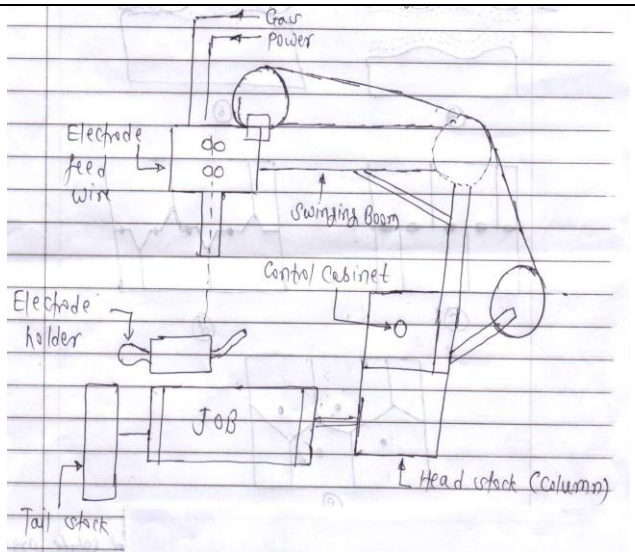
Q. NO.	MODEL ANSWER	MARKS	TOTAL MARKS
Q.1.	**Attempt any FIVE**	**5x4**	**20**
a. **Ans.**	 NOTE A water-cooled welding torch is used when cooling from the inert gas shield is inadequate. Figure 10-33. Gas tungsten arc welding equipment arrangement. **Gas tungsten arc welding** (**GTAW**), also known as **tungsten inert gas** (**TIG**) **welding**, is an arc welding process that uses a non-consumable tungsten electrode to produce the weld. The weld area is protected from atmospheric contamination by an inert shielding gas (argon or helium), and a filler metal is normally used, though some welds, known as autogenously welds, do not require it. A constant-current welding power supply produces electrical energy, which is conducted across the arc through a column of highly ionized gas and metal vapors known as a plasma.	2m 2m	4

b. **Ans.**	 • **Electroslag Welding** is a welding process, in which the heat is generated by an electric current passing between the consumable electrode (filler metal) and the work piece through a molten slag covering the weld surface. • Prior to welding the gap between the two work pieces is filled with a welding flux. Electroslag Welding is initiated by an arc between the electrode and the work piece (or starting plate). Heat, generated by the arc, melts the fluxing powder and forms molten slag. The slag, having low electric conductivity, is maintained in liquid state due to heat produced by the electric current.	2m (Dia) 2m	4
c. **Ans.**	**Advantage of MIG** • Because of continuously fed electrode MIG welding is much faster as caompared to TIG. • It can produce joint with deep penetration. • Thick and thin both type of joints can be welded effectively • Large metal deposition rates can be achieved • Process can be easily mechanized • No flux is required **Limitation-** 1) The process is slightly more complex, as compared to TIG because no of variable 2) Welding equipment is more comlex,more costly	2m (any 2)	4

	and less portable 3) Since air draft may disperse the shielding gas it will not be useful in open atmosphere condition 4) Weld metal cooling rate are higher than the process that deposit slag over the weld metal	2m (any 2)	
d. **Ans.**	In continuous drive friction welding, welding heat is obtained at the joint by rotating one part against the other at a constant or varied RPM, with an axial force applied to the mating components. Energy is provided to this joint from a continuously running prime mover - usually an electric motor, directly connected to the machine spindle. This energy source is infinite with respect to time, and is supplied to the interface until the proper total heat is obtained. When this point is reached, the rotating member is stopped and a forging load is applied to the parts to be joined. It's important to note that the speed is held constant for a selected time and/or distance, as pressure is varied. The displacement of material at the interface is a function of heat input and pressure. Rate of heat input is a function of rotational speed and axial pressure. By combining specific rotational speeds and specific pressures, variations in the rate of metal displacement and volume of metal displacement can be obtained.	4m	4
e. **Ans.**	Micro Arc Welding is the short and long-run service provider delivering hand held micro TIG and micro laser welding repair work. Micro welding is the name given to the process that has evolved from traditional TIG welding (or more recently termed GTAW), using the technology of electric current being applied to the workpiece to generate heat at the point of the *arc gap.* At the point of the arc gap, a molten pool is established and the filler rod is introduced into the molten pool. The difference between traditional TIG and micro welding is that micro welding is done at extremely low amperages (usually less than 10 amps) in combination with fine control of the amperage range, along with the aid of a high-powered (10-20X or more) microscope. In the micro welding process the technician performing the weld repair—in combination with the welding	4m	4

	equipment controls and the weld wire selection—is absolutely critical to end results. Applications:- Medical Device Manufacturing • Fire Arms Manufacturers • Tool & Die Industry • Aerospace		
f. **Ans.**	**Defination:-** **Resistance welding** is defined as a process whereby force is applied to surfaces in contact and in which the heat for **welding** is produced by the passage of electric current through the electrical **resistance** at, and adjacent to, these surfaces. **Applications:-** • Automotive / auto suppliers • Electrical / electronics • Aerospace / air plane • Train carriage / rail • Radiator / container • Domestic hardware • Medical instruments • Nuclear equipment • Food and drink • Other metal processing industries.	2m 2m (any four)	4
g. **Ans.**	Process equipment code (ASME) The ASME Code section 8 is the construction code for pressure vessel and cover design, manufacturing and pressure vessel inspection and testing in the manufacturing shop. This code section addresses the mandatory requirement, specific prohibitions, and non-mandatory guided for pressure vessel material design fabrication, examination,inspection,testing,certification and pressure relief. In this article you will learn about different subsection s and guidelines for the use and application of this code. For ASME code section 8 Scope and boundaries, review the	4m	4

	pressure vessel definition article You may ASME code section 8 has three division. Division 1 covers pressure up to 3000psi,Division 2 Has an alternative rule and covers up to 1000psi and Division 3 can be used for pressure higher than 10000psi		
Q.2	**Attempt any FOUR**	**4X4**	**16**
a. **Ans**	**Advantages:-** 1. Molten flux provides very suitable conditions for high current to flow. Great intensities of heat can be generated and kept concentrated to weld thicker sections with deep penetrations. 2. Because of high heat concentration, considerably higher welding speeds can be caused. 3. Because of high heat concentration and high welding speeds weld distortion is much less. 4. High metal deposition rates can be achieved. Single pass welds can be made in thick plates with normal equipment. 5. Welding is carried out without sparks, smoke, flash or spatter. 6. Weld metal deposit possesses uniformity, good ductility, corrosion resistance and good impact strength. **Limitations:-** 1. Since the operator cannot see the welding being carried out, he cannot judge the progress of welding accurately. Therefore accessories like jigs and fixtures, pointers, light beam focusing devices or roller guides may be used for proper welding at the joint. 2. The flux needs replacing of the same on the joint which is not always possible. 3. The progress is limited to welding in flat position and on the metal more than 4.8 mm thick. In small thicknesses burn through is likely to occur. 4. The process requires edge preparation and accurate fit up on	2m (any 2) 2m (any 2)	4

	the joint. Otherwise the flux may spill through the gap and arc may burn the workpiece edges. 5. Flux is subjected to contamination that may cause weld porosity.		
b. **Ans.**	 Explanation Manipulators are singularly the most variable piece of equipment directly associated with automatic welding. They can be designed to weld sequentially different procedure on the same weldment It provide consistency and accuracy by bring the welding head nearer to the work piece. It mainly consists of column, boom,electrical equipment and hand control box. Column can perform leftward and rightward and also up and down movement to meet weld need. Hand control box is designed to control the operation.	2M 2M	4

c.

Ans.

SR NO	FCAW	SAW
1	Flux cored arc welding (FCAW) is an electric arc welding process that uses an arc between a continuously fed flux-filled electrode and the weld pool.	Submerged arc welding (SAW) is an arc welding process that fuses together the parts to be welded by heating them with one or more electric arcs between one or more bare electrodes and the work piece
2	The electrode used in this process is flux coated.	The electrode used in this process is a bare one.
3	The electrode is hollow	The electrode is solid.
4	The flux contained in the hollow electrode acts as a sheilding	Separate shielding is required in this process.

4m

(1m each)

4

d

ans

Advantages:-

- No external power source is required (heat of chemical reaction is utilized);
- Very large heavy section parts may be joined.
- Thicker plates can be welded very easily

2m adv.

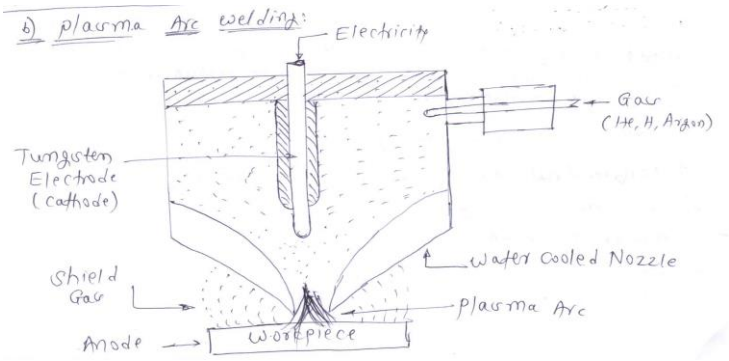
Disadvantages:-

- Only ferrous (steel, chromium, nickel) parts may be welded;
- Slow welding rate;
- High temperature process may cause distortions and changes in Grain structure in the weld region.
- Weld may contain gas (Hydrogen) and slag contaminations.

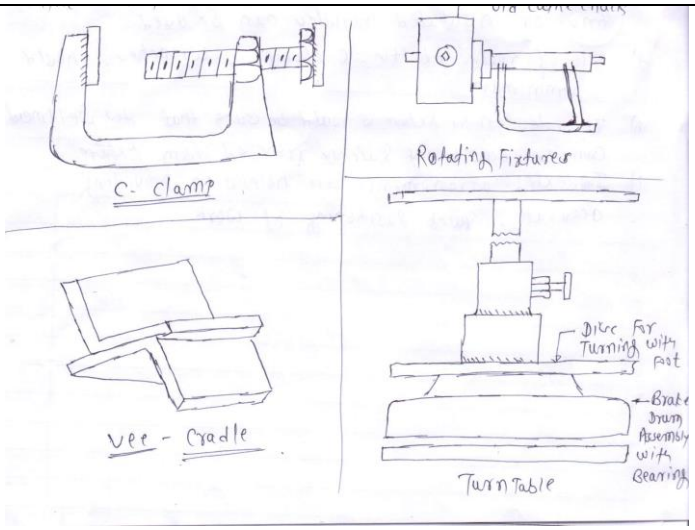
2m disadv.

4

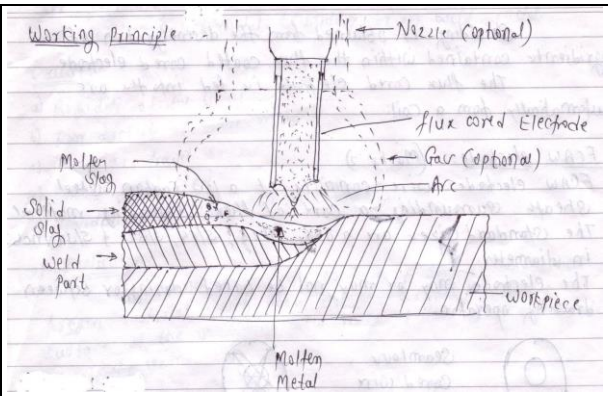
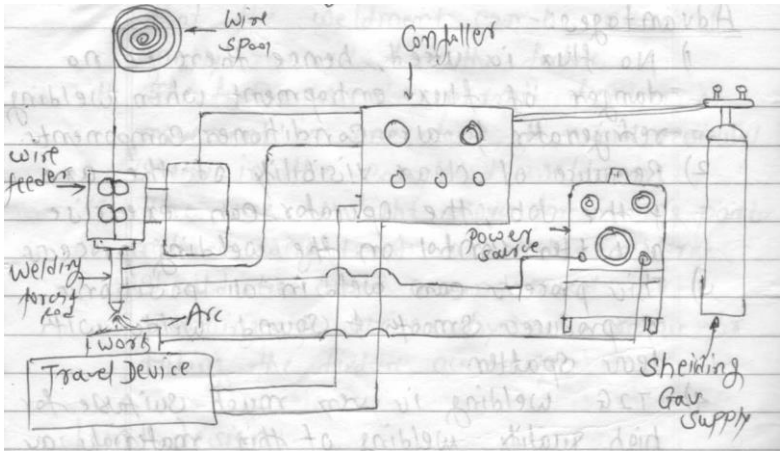
e ans	Advantages of Resistance Welding: • High welding rates; • Low fumes; • Cost effectiveness; • Easy automation; • No filler materials are required; • Low distortions. Disadvantages of Resistance Welding: • High equipment cost; • Low strength of discontinuous welds; • Thickness of welded sheets is limited - up to 1/4" (6 mm);	2m adv. 2m disadv.	4
Q.3.	**ATTEMPT ANY TWO**	**2x8**	**16**
a. **Ans.**	Definition Distortion in welding can be defined as the expansion and contraction of weld metal and adjust base metal during the heating and cooling cycle of welding process. It is an unintentional destruction of weld metal. Doing welding in one side of the part will cause much more distortion than if the welds are alternated from one side to other. **Types** 1) Longitudinal shrinkage 2) Transverse shrinkage 3) Angular distortion 4) Twisting 5) Bowing and dishing. 6) Buckling Causes: • More number of passes with lower diameter of electrode • Slow arc travel speed. • High residual stress in plates to be welded	2M 3M 3M	8

	• Due to improper electrode angle		
b. **Ans.**	 **Working:-** • Plasma is gas of positive ions and negative electron equal number of positive ions and negative electron. • In PAW joint is produced by striking an arc in between tungsten electrode and water cooled nozzle. • When the laser are passed through arc and nozzle they get ionize and becomes plasma • The laser generally used are argon, helium and hydrogen • Non consumable tungsten within a water cooled nozzle is enveloped by a gas.the gas is forced to an electric arc through a constraint opening at the end of water cooled nozzle. Temperature have been reported to 10000 to 30000^{0}C as comparison oxyacetylene welding is limited to 3600^{0}C Advantages:- 1. Both thin as well as thick weld joints can be made 2. Strong, uniform and dense weld can be produced. 3. High welding rates 4. No filler material is required	3M 3m 2m	8

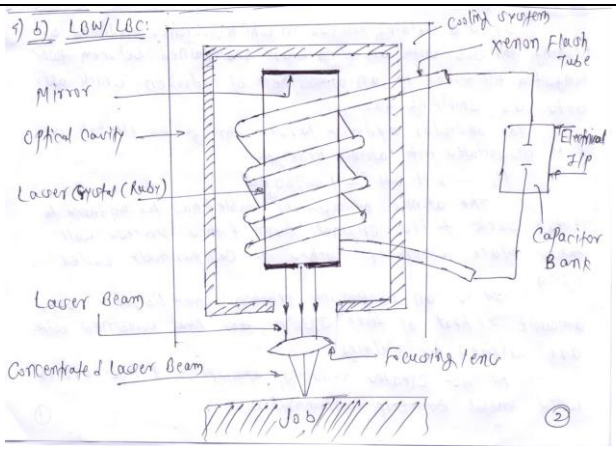
c. **Ans**	Following are the equipments used in latest welding **1) Welding cycle controller:-** the basic function of this component is to control the weld time, squeeze time etc . for prcise method. **2) Workpiece Positioning Sensor:-** The basic function of this component is to position the workpiece in the correct manner . **3) Modern Jigs & Fixtures:-** the welding fixtures are usually designed to hold one specific assembly. **4) Electrode Feed Controller:** it will control the electrode feed rate. **5) Fume Extracters:** The gases which are generated during the welding can be removed by using fume extracters.	8m (any 4)	8
Q.4.	**Attempt any FOUR**	**4x4**	**16**
a. **Ans.**	• A C- clamp is good enough for most welding jobs. It can be quickly and cheaply made in the shop • A simple but effective Vee rest for supporting short bars or pieces of pipe for welding on the bench is shown in fig. • Rotating fixture for making circumferential welds or for building up rollers, rings,valves,drilling bite and axles are very valuable as they speed up the job.	2M	4

		2m	
b. **Ans.**	**Safety Practices** • The light generated by MIG welding is extremely bright, working directly on welding arc even for a short time causes arc eye therefore it is recommended to use welding cap and welding screen or welding mash or goggle. • Al.alloys vapour and zinc coating are poisonous exposure can result in heavy metal poisoning flue like symptoms. The zinc coating should be removed before welding and one can wear charcoal mask. • Covering of arms and legs is essential because strong ultraviolet light emiting from MIG may cause sun sum. • Welding gloves are required to be wear • Ear protection device to avoid too much noise • Clean atmosphere i.e. Surrounding is required because molten metal may split several feet may catch fire Use our common sense while welding.	4m (ANY 4)	4
c.	Advantage of ESW 1) Joint preparation is much simpler than for other welding process.	2m (any 2)	4

Ans.	2) Residual stresses and distortion produced are low 3) Much thicker steel can be welded in single pass and more economically. 4) Extremely high deposition rate. Flux consumption is low. 5) As no arc exists no spattering or instance are flashing occurred Disadvantage 1) Submerged arc welding is more economical for joint below 60mm thickness than ESW 2) In ESW there is some tendency towards hot cracking and notch sensitivity 3) Welding is carried out vertical up Hill position 4) It tends to produce large grain size	2m (any 2)	
d ans	1. Size & thickness of the plate 2. Material of the plate 3. Position or location where welding is to be done. 4. Matching strength 5. Tolerance of dilution (absorption of base material into weld metal). 6. Machinability 7. Tolerance of high cooling rates 8. Weldability at low heat inputs 9. Colour matching 10. Sufficient ductility to absorb welding strains	4m (any 4)	4m
e ans			

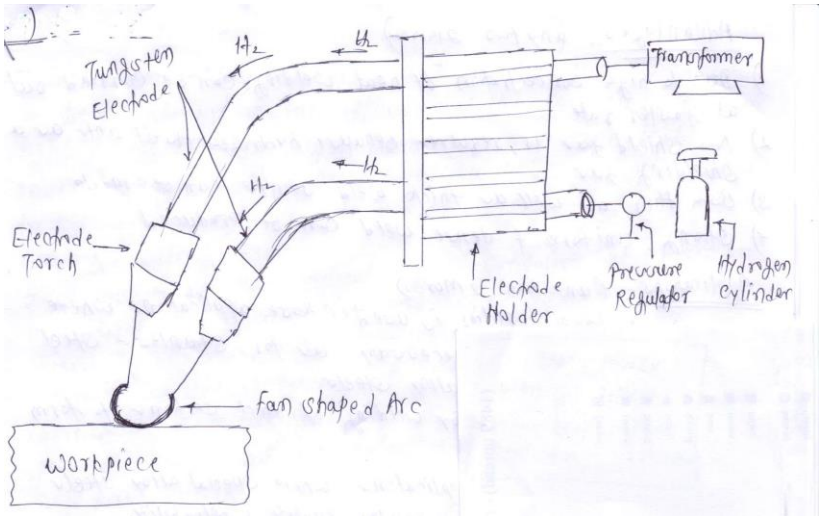
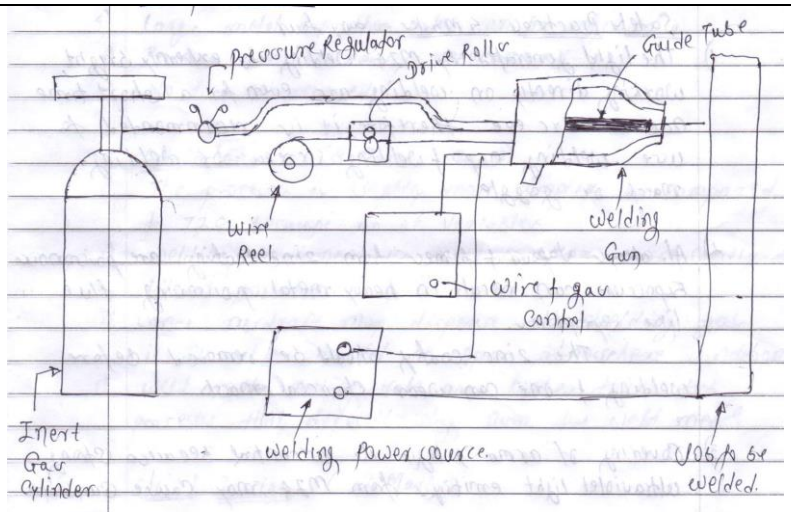
	 Working principal FCAW is a process in which joint is produced by heating the work piece with an electric arc between a continuous tabular consumable electrode and work. The electrode is flux cored i.e. the flux is contained within the electrode which is hollow. The flux inside the wire provided the necessary shielding of the weld pool FCAW utilizer the heat of an arc between a continuously fed consumable flux cored electrode and the work piece which is to be joined. The heat of the arc melts the surface of base metal and the end of the electrode. The metal melted off the electrode is transferred through the arc to the work piece	2m 2m	4m
f **ans**		2m	4m

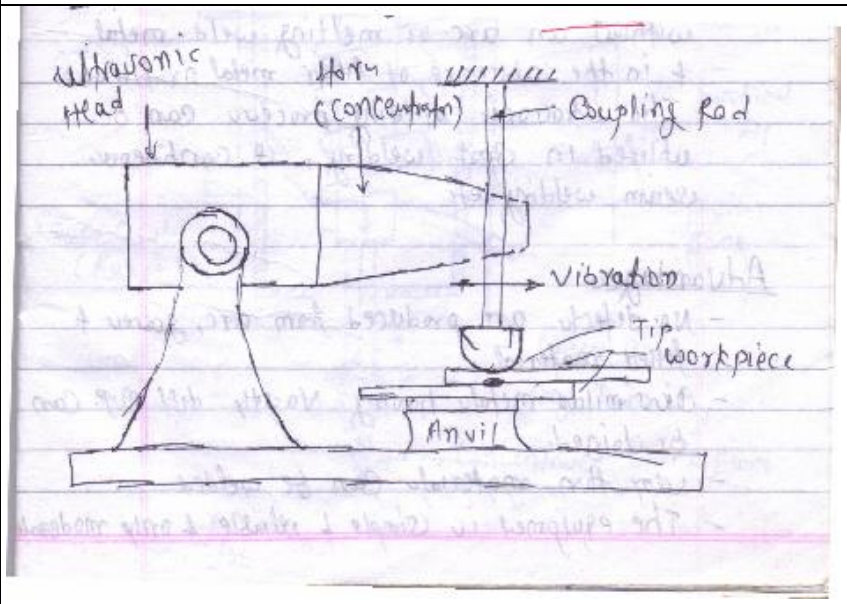
	Automatic Welding: In automatic welding some of the activities are carried out without manual work. In this type of welding the control of welding variable and relative movement between the welding head and work are automatic Usually a single switch working through sequencing device operator the control for power and consumables like wire and gas This may also bring crater filling device, if incorporated, into action automatically.fig.shows a block diagram for a typical automatic welding system. As soon as welding is started first in manual way automatic welding controls the variables like arc voltage, welding current. Wire feed rate etc. to control the arc length in the case of arc welding processes and to control the depth of molten metal and slag pool in electro slag welding. On the other hand it also controls the relative motion between the welding head and the work to attain the desired welding speed. The automatic welding system is most popular with SAW and ESW processer; It is also used to a limited extent with GTAW, GMAW, FCAW and plasma arc welding process.	2m	
Q.5	**Attempt any four**	**4x4**	**16**
a. **Ans.**	All the common arc processes are applicable in Welding-alloy-steel, the selection being determined mostly by economic and practical considerations. However certain precautions must always be considered: low hydrogen consumables, preheat and postheat to drive hydrogen away and to avoid cold cracking, besides controlling the microstructures formed. For these reasons, Shielded Metal Arc Welding-alloy-steel is performed with low hydrogen electrodes. The purpose of the selection of filler metal is to match in the weld metal not so much chemistry and composition, but rather the mechanical	4m	4m

	properties obtainable after proper heat treatment. Some electrodes not covered by accepted Standards are offered for special purposes by manufacturers. Gas Tungsten Arc Welding is considered best capable of controlling hydrogen content to the minimum and is therefore the process of choice for critical Welding-alloy-steel applications. for useful advice.		
b. **Ans.**	 Working:(2M) • Laser beam welding/cutting is that joint is produced by heat obtain from the application of the concentrated coherent light beam impinging upon the surface to be joined/cut • Laser is device which creates intense beam that can impart tremendous energy on a small area to produce fusion for welding/cutting purpose. • It consists of ruby crystal which contains at chromium in dispersed condition. The ends of their rods are like mirror and one end has a tiny hole. • At the outside of the crystal one flash tube is fixed containing insert gas. It is de----for producing thousands of flashesh per second which further converts electrical energy into light energy. • Capacitor bank which strikes electrical energy energizes flash tube by an triggering system because of that xenon transforms a high proportion of electrical	2m 2m	4m

	energy into white light flashes • As ruby is exposed to intense light flashes chromium atomic to excite and pumped to high energy level because of that they form radiation in the form of red Fluor cent light. When that red light escape through mirror through a small hole and by focusing on a narrow laser beam on optical lenses produces intense spot of laser on the job • Optical energy as it impacts on the work piece converts into heat energy.the temperature generated can be made sufficient to melt materials to be welded or cu		
c. **Ans.**	Shielding gases (4M) Following are shielding gases (1)Argon: • It is the extensively used shielding gas because of its availability as far as fusion welding is concerned. • 0.94%is the % argon by volume prevent in the atmosphere. • It is used as a shield gas because of its low ionization potential, it forms stable and suite arc so there is less chance of spatter loss. • It has one disadvantage because of its lower ionization potential the voltage is reduced and less power in the arc is obtained. Because of that it does not give deeper penetration • As it is heavier can be replaced to air very easily (2)Helium: • It is the second most abundant available natural gas in the atmosphere. • It has higher ionization potential than argon.so it gives deeper penetration • It has high electrical resistance so the voltage required to produce more and because of that high heat is	4m (any 2)	4

	generated in the arc • It again increases the penetration properties (3)CO_2: 5) It is a combination of carbon and oxygen 6) The experiment shown that using straight CO_2gives border and deeper penetration as well as there is a less chance of under cutting.		
d **ans**	• Procedure number • Process type • Consumable Size, Type and full Codification. • Consumable Baking Requirement if applicable • Parent material grade and spec. • Thickness range. • Plate or Pipe, Diameter range • Welding Position • Joint Fit Up, Preparation, Cleaning, Dimensions etc. • Backing Strip, Back Gouging information. • Pre-Heat (Min Temp and Method) • Interpass If Required (Maximum Temperature recorded) • Post Weld Heat Treatment. If Required (Time and Temp) • Welding Technique (weaving,max run width etc.) • Arc Energy Limits should be stated if impact tests are required or if the material being welded is sensitive to heat input.	4m	4m
e **ans**	In recent years since the size of the product becomes smaller in electrical and electronics industries, then the joining of thin metal sheets has been required. the flexibility in the process is important according to the accessibility in case of the small components. however when we will going to weld such small sheets it will tend to distortion & automatically it can be treated as a scrap. So as to avoid this the precision welding comes in to picture. Precision welding is the name given to the process that has	4m	4m

	evolved from traditional TIG welding (or more recently termed GTAW), using the technology of electric current being applied to the workpiece to generate heat at the point of the *arc gap.* At the point of the arc gap, a molten pool is established and the filler rod is introduced into the molten pool.		
f **ans**		4m	4m
Q.6 **.**	**Attempt any FOUR**	**4x4**	**16**
a. **Ans** **.**	 • Switch ON the electrical current, insert gas supply and water • The arc is strucked by the any one method. • By scratching the electrode by scrap metal work	2m 2m	4

	piece as usual practice • In the second method electrode is touched to the job. It is refracted and then move forward to carry out welding • About 15mm length of the electrode is projected from the torch before striking the arc. During welding torch remain about 10 to 12mm away from the job and arc length is kept between 1.5mm to 4mm • Normally forehand technique is used, the angle made by torch with the horizontal is 70^0 • The welding Gun is moved in forward manner steadily to achieve good welding.		
b. **Ans**	 Ultrasonic welding will join similar or dissimilar metals by the introduction of high frequency vibratory energy(20000 to 60000 Hz) into overlapping metals into the area tobe joined. No flux or filler metals are used , no electrical current passes through the weld metal & usually no heat is applied. The parts to be joined are clamped together between a welding tip & a supporting member under low static pressure.	2m 2m	4

c **Ans.**	**Hot plate welding** In hot plate welding, the parts to be welded are held in fixtures, which press them against either side of a heated platen. Once the parts are sufficiently molten, the platen is removed. The components are then pressed together and held until they are cooled. Hot plate welding is a versatile technique with equipment available for factory use or in a portable form suitable for on-site use. The heated platen is generally flat, but three-dimensional joint profiles can be achieved with the design of a more complex plate geometry. Hot plate welding has the drawback of being a relatively slow process with weld times ranging from 10 seconds for small components to 1 hour for parts with a large joint area. However, short-term weld strengths equal to that of the parent material can be achieved. Hot plate welding can be performed on composite components, using higher welding forces, but high temperature resins such as PEEK have a tendency to stick to the hot plate during heating. The most important application of hot plate welding is in the joining of thermoplastic water, gas and effluent pipes where it is often referred to as butt fusion welding. It is also used by the automotive industry in the manufacture of fluid reservoirs and in the welding of PVC door and window frames. **Hot bar welding** Hot bar welding is a technique for the sealing of films. A heated metal bar applies pressure to the films, softens the plastic at the joint and forms a weld. The equipment consists of one or two electrically heated bars, one of which is hinged for the insertion and removal of the films. The film is placed on the base bar, the upper bar is brought down and pressure is applied either mechanically by the operator, or pneumatically. After the required weld time the bar is lifted to release the joined films. The bars are often PTFE coated to prevent molten polymer from adhering to them. Hot bar welding is a rapid process. Typical weld times for a 100µm thick sheet are in the range from 1-3 seconds. A reduction in welding time can be achieved by the use of two heated bars, one on either side of the films to be joined. The necessity for the heat to conduct through the film to the joint, imposes a restriction on the thickness of material that may be welded, of approximately 1mm.	4M (ANY 2)	4m

	Hot bar welding is widely used in industry, mainly in the joining of thermoplastic films having a thickness of less than 0.5mm. It could be used to weld thin composites and has the potential to tack prepregs. It is used extensively within the packaging industry for producing plastic bags. **Impulse welding** Impulse welding is an advanced form of hot bar welding in which both the heating and cooling regimes are controlled whilst the joint is still under pressure. **Hot gas welding** Hot gas welding of thermoplastics is a manual welding technique, analogous to oxygas welding of metals. In the hot gas gun, a stream of gas (typically air) passes over an electrically heated element and emerges from a nozzle. The stream of heated gas is directed towards the joint between two thermoplastic parts, where it melts or softens the polymer and a filler rod. A weld is formed by the fusing together of the thermoplastic parts and the filler rod, which is composed of the same polymer type as the parts. The main advantage of hot gas welding is that the equipment is easily portable. However, it is a slow process and the weld quality depends on the skill of the operator. Typical applications include chemical storage vessels and pipework. **Extrusion welding** Extrusion welding is similar to hot gas welding except that the filler material is separately heated in the barrel of a hand-held screw extruder. The molten material is then extruded through a PTFE die into the joint. The joint is pre-heated using a hot gas gun mounted on the extruder barrel. It is preferable to hot gas welding when thicker sections are to be joined. Extrusion welding could be used for composites although the weld strength would be that of the filler rod and not the composite. **Flash free welding** Flash free welding refers to techniques for butt joining thermoplastic parts (sheets, pipes or rods) without the generation of weld flash. The parts to be joined are butted together and fixed in place to prevent axial movement during the welding cycle. The parts are then constrained laterally using heated metal parts, which would be bars for joining sheets or a collar in the case of		

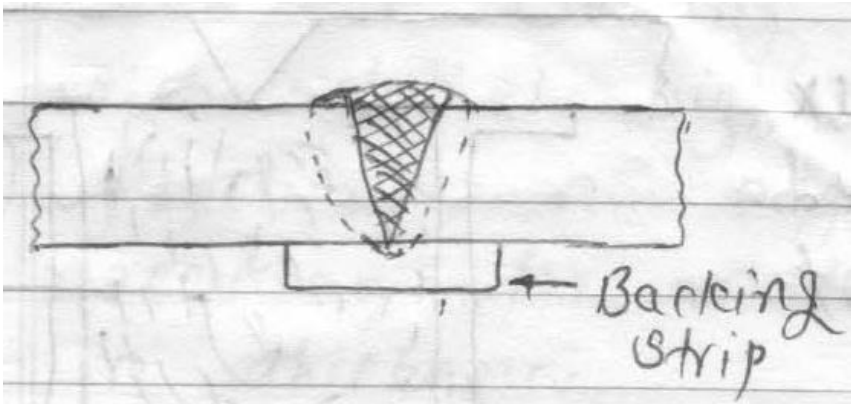
	pipes and rod. As the metal parts are heated to above the melting point of the thermoplastic, the material at the joint softens and melts. However, it is totally constrained and a melt pressure is built up due to thermal expansion. For pipes, the molten material is prevented from extruding into the bore by using an inflatable bladder, which is expanded at the joint-line prior to welding. After a predetermined time, related to the thickness of the thermoplastic part, the heat supply is switched off and the joint is allowed to cool. Flash free welding machines are currently only commercially available for joining thermoplastic pipes, where the smooth bore at the joint-line is a major advantage for high purity applications, such as in the food or pharmaceutical industries		
d	API1104:- American Petroleum Institute (AP!) Standard 1104 – Welding of Pipelines and Related Facilities This standard was prepared by a formulating committee that included representatives of the American Petroleum Institute, the American Gas Association, the Pipe Line Contractors Association, the American Welding Society, and the American Society for Nondestructive Testing, as well as representatives of pipe manufacturers and individuals associated with related industries. BS4515-1: specifies requirements for the welding of carbon, carbon manganese and low alloy steel pipelines with specified minimum yield strengths not exceeding 555 $N/mm^2$and designed in accordance with PD 8010-1 and PD 8010-2 BS 4515-1 applies to pipes of outside diameter 21.0 mm and larger having a thickness of 3.0 mm or greater and is applicable to transmission pipelines for gases, liquids or slurries, both on land and offshore. Information on hyperbaric welding and on brazing and aluminothermic welding of anode bonding leads, and recommendations for the welding of corrosion resistant alloy clad and lined pipelines, are provided. PIPING WELDING CODES:- (ASME) ASME is the registered trademark of The American Society of Mechanical Engineers. The ASM.E B31 Code for Pressure Piping consists of a number of individually published Sections, each an	4m (any 2)	4m

<table>
<tr><td></td><td>American National Standard, under the direction of ASME Committee B31, Code for Pressure Piping. Rules for each Section have been developed considering the need for application of specific requirements for.</td><td></td><td></td></tr>
<tr><td>e</td><td>
<table>
<tr><th>Sr. No.</th><th>SAW</th><th>MIG</th></tr>
<tr><td>1</td><td>Submerged arc welding (SAW) is an arc welding process that fuses together the parts to be welded by heating them with one or more electric arcs between one or more bare electrodes and the work piece</td><td>It is an arc welding process in which joint is prepaed by heating the job with an electric arc established between a continuously fed metal electrode & the job.</td></tr>
<tr><td>2</td><td>SAW uses a flux.</td><td>No flux is used.</td></tr>
<tr><td>3</td><td>Separate shielding gas is not required</td><td>Separate shielding gas is used.</td></tr>
<tr><td>4</td><td>The arc is buried under the granular flux.</td><td>The arc is visible to the operator.</td></tr>
<tr><td>5</td><td>Process is slow</td><td>Comparitively faster process.</td></tr>
</table>
</td><td>4m
(any 4)</td><td>4</td></tr>
<tr><td>f</td><td>Weld Backing:

Submerged arc welding producer a large volume of highly fluid weld metal which needs to be supported (backed) until.it solidifies when making butt welder in one pass where complete penetration is desired.

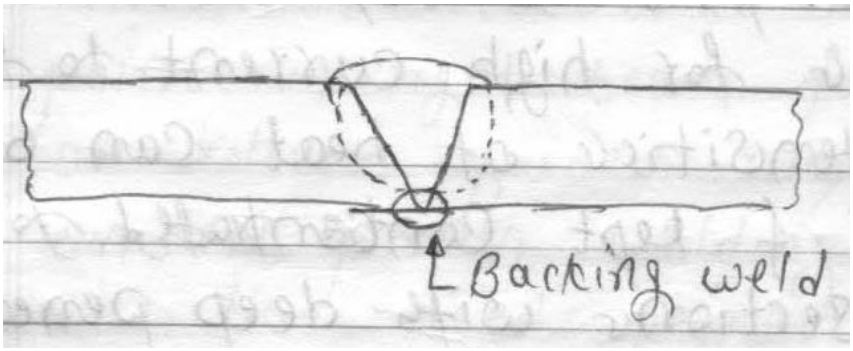
The following methods are used to sack up the welds:

(1)Backing strips:

 
</td><td>4m
(any 2)</td><td>4m</td></tr>
</table>

The weld penetrate and fuse with the backing strip which temporarily or permanently becomes an integral part of the weldments. The backing strip metal should be such that it should not contaminate the weld metal.

(2)Backing weld:

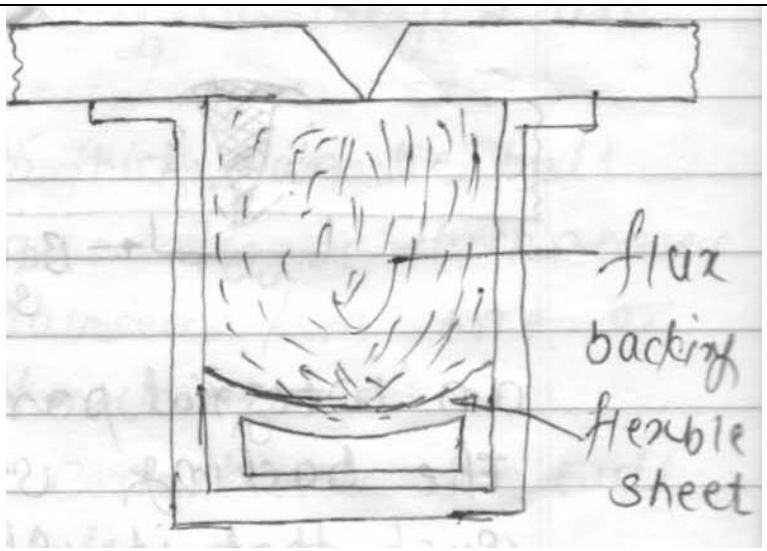


One or two layer of weld metal is applied on the underside of the seam to support weld metal that will be deposited from the opposite side.

(3)Copper backing:

Bar grooved or ungrooved straight or circular is used to support molten weld pool. Such a bar does not fuse and became a permanent part of weld .Copper chills molten metal rapidly.

(4)Flux backing:

	 Moderate flux pressure is developed on the back side of the weld.		