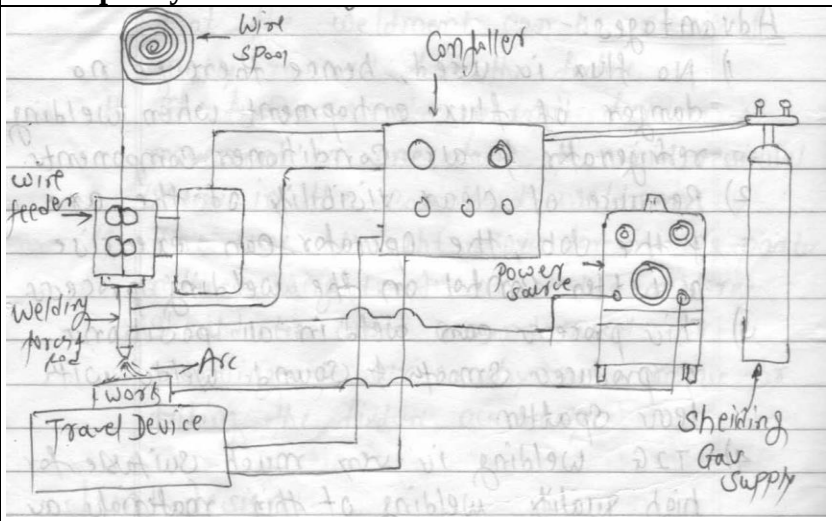
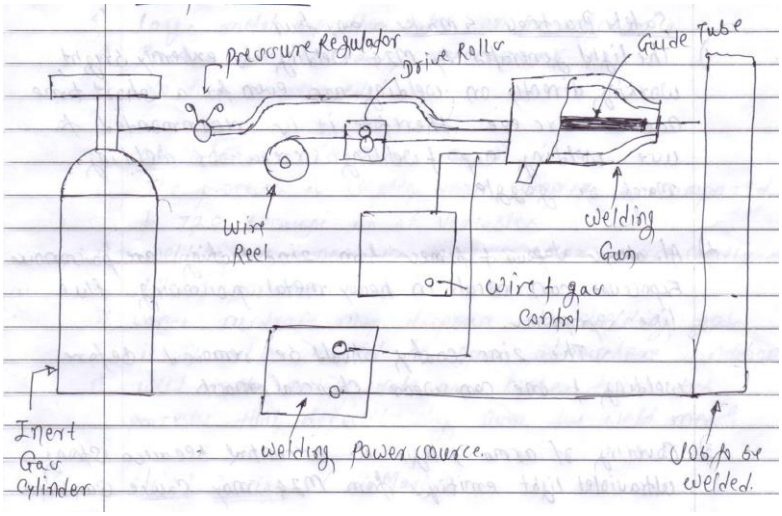
SUMMER – 16 EXAMINATIONS

Subject Code: **17621** **Model Answer** Page No: ____/ N

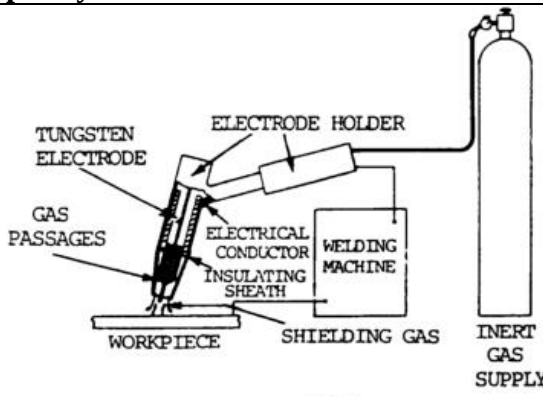
Important Instructions to examiners:

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.

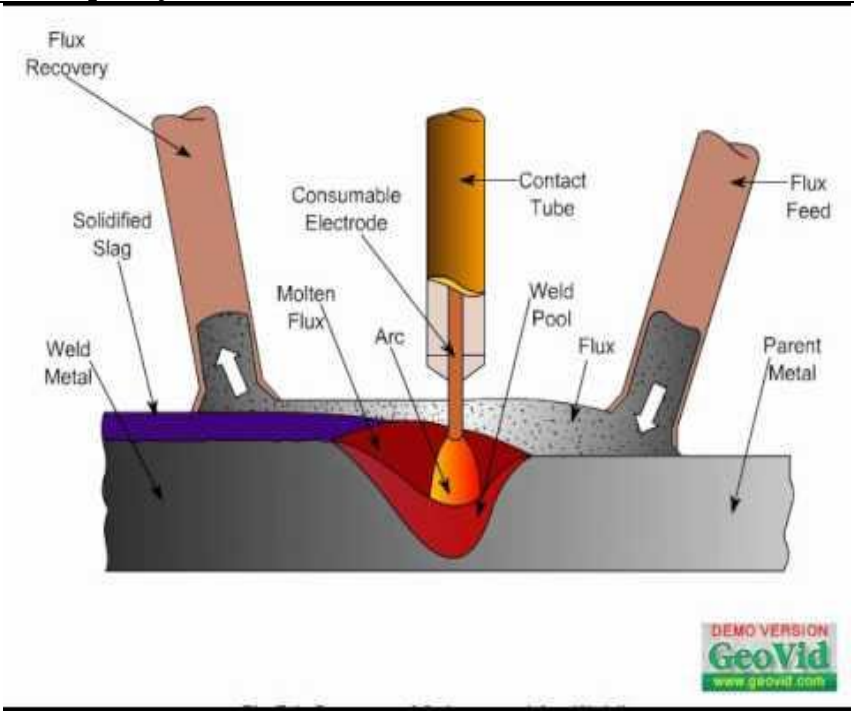
Q. NO.	MODEL ANSWER	MARKS	TOTAL MARKS
Q.1.	**Attempt any FIVE**	**5x4**	**20**
a. Ans.	 **Working:-** In automatic welding some of the activities are carried out without manual work. In this type of welding the control of welding variable and relative movement between the welding head and work are automatic 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.	2m (dia) 2m expl.	4m

b. **Ans.**	 Working:- • 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 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.	2m (Dia) 2m expl.	4m
c.	**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,	4m (1m for each any 4)	4m

	corrosion resistance and good impact strength.		
d. **Ans.**	**i) Application of PAW:-** • Manufacturing of tubing made of stainless steel, titanium. • Used for welding of foil thickness material. • It is also used for making small welds on weldments for instruments manufacturing & other small components made up of thin metal. **ii) Applications of Ultrasonic Welding:-** • In the electrical and computer industry ultrasonic welding is often used to join wired connections and to create connections in small, delicate circuits. • For automobiles, ultrasonic welding tends to be used to assemble large plastic and electrical components such as instrument panels, door panels, lamps, air ducts, steering wheels, upholstery and engine components. • In the medical industry ultrasonic welding is often used because it does not introduce contaminants or degradation into the weld and the machines can be specialized for use in clean rooms. • Packaging is an application where ultrasonic welding is often used. Many common items are either created or packaged using ultrasonic welding. Sealing containers, tubes and blister packs are common applications. • It is also used in packaging of dangerous materials like explosives.	2m (any 2) 2m (any 2)	4m
e. **Ans.**	Advantages of Resistance Welding: • High welding rates; • Low fumes; • Cost effectiveness; • Easy automation; • No filler materials are required; • Low distortions	4m (any 4)	4m
f. **Ans.**	**Defination:-** **Distortion** or deformation can occur during **welding** as a result of the non-uniform expansion and contraction of the **weld** and base metal during the heating and cooling cycle. FOLLOWING ARE THE TYPES OF DISTORTION • Longitudinal shrinkage • Transverse shrinkage • Angular distortion • Bowing and dishing • Buckling • Twisting	2m 2m (any four)	4m

g. Ans.	**Plastic welding** : welding for semi-finished plastic materials is described as a process of uniting softened surfaces of materials, generally with the aid of heat (except solvent welding). Welding of thermoplastics is accomplished in three sequential stages, namely surface preparation, application of heat and pressure, and cooling. Numerous welding methods have been developed for the joining of semi-finished plastic materials ,based on the mechanism of heat generation at the welding interface, welding methods for thermoplastics On the other hand, production of a good quality weld can not only depend on the welding methods, but also weld ability of base materials. Therefore, the evaluation of weld ability is of important critically before welding operation.	4m	4m
h.	I. American Society of Mechanical Engineers (ASME) Codes II. American Welding Society (AWS) Standards III. American Petroleum Institute (API) Standards IV. Australian / New Zealand (AS/NZS) Standards V. British Standards (BS)[edit] VI. European Union (CEN) standards	4m (any 4)	4m
Q.2	**Attempt any TWO**	**8X2**	**16**
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. **WORKING:-** **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	3m (dia) 3m (working)	8m

	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 **Applications:-** 1. While the aerospace industry is one of the primary users of gas tungsten arc welding, the process is used in a number of other areas. 2. Many industries use GTAW for welding thin workpieces, especially nonferrous metals. 3. It is used extensively in the manufacture of space vehicles, and is also frequently employed to weld small-diameter, thin-wall tubing such as those used in the bicycle industry. 4. In addition, GTAW is often used to make root or first-pass welds for piping of various sizes. **5.** In maintenance and repair work, the process is commonly used to repair tools and dies, especially components made of aluminum and magnesium..	2m (any 2 applications)	
b. **Ans.**	(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 (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 generated in the arc It again increases the penetration properties (3)CO2: It is a combination of carbon and oxygen The experiment showed that using straight CO2gives border and deeper penetration as well as there is a less chance of under cutting.	3m for list & 5m for explain	8m

c. **Ans.**	**Safety Rules:-** 1) 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. 2) 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. 3) Covering of arms and legs is essential because strong ultraviolet light emiting from MIG may cause sun sum. 4) Welding gloves are required to be wear. 5) Ear protection device to avoid too much noise. 6) Clean atmosphere i.e. Surrounding is required because molten metal may split several feet may catch fire. 7) Use our common sense while welding. **Welding protective Equipments:-** Welding helmet, hand shield, or goggles. Respirators. Fire/Flame resistant clothing and aprons. Fire/Flame resistant clothing and aprons. Boots, gloves, gauntlets.	5m (any 5 rules) 3m (any 3)	8m
Q.3.	**Attempt any TWO**	**8x2**	**16**
a. **Ans.**		3M (dia)	8m

	WORKING:- Similar to MIG welding, SAW involves formation of an arc between a continuously-fed bare wire electrode and the workpiece. The process uses a flux to generate protective gases and slag, and to add alloying elements to the weld pool. A shielding gas is not required. Prior to welding, a thin layer of flux powder is placed on the workp iece surface The arc moves along the joint line and as it does so, excess flux is recycled via a hopper. Remaining fused slag layers can be easily removed after welding. As the arc is completely covered by the flux layer, heat loss is extremely low. This produces a thermal efficiency as high as 60% (compared with 25% for manual metal arc). There is no visible arc light, welding is spatter-free and there is no need for fume extraction. **Applications:-** Welding of following materials • Carbon steels (structural and vessel construction) • Low alloy steels • Stainless steels • Nickel-based alloys • Surfacing applications (wear-facing, build-up, and corrosion resistant overlay of steels)	3M (working) 2m (2 applications)	
b.	**Flux Cored Arc Welding:-** 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.	4m (FCAW)	8m

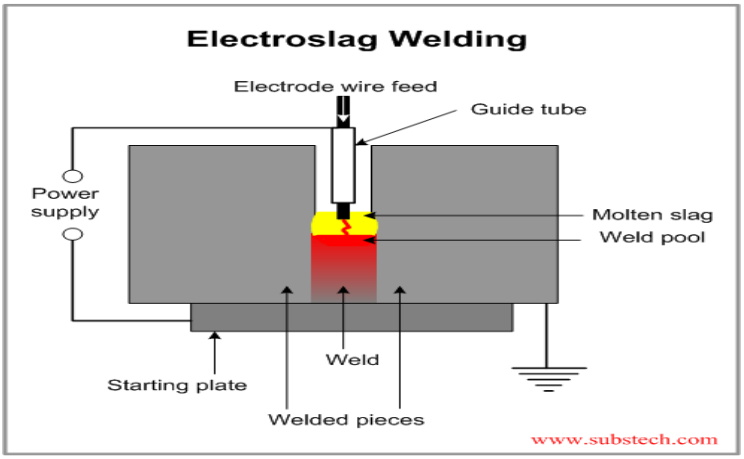
Difference between FCAW & ESW:-

FCAW	SAW
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
The electrode used in this process is flux coated.	The electrode used in this process is a bare one.
The electrode is hollow	The electrode is solid.
The flux contained in the hollow electrode acts as a shielding.	Separate shielding is required in this process.

4M (DIFFERENCE)

c.

Ans.



3M (dia)

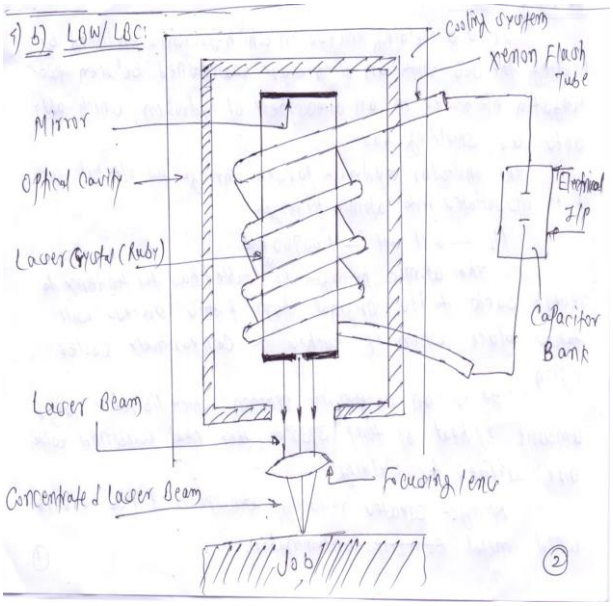
Working:-

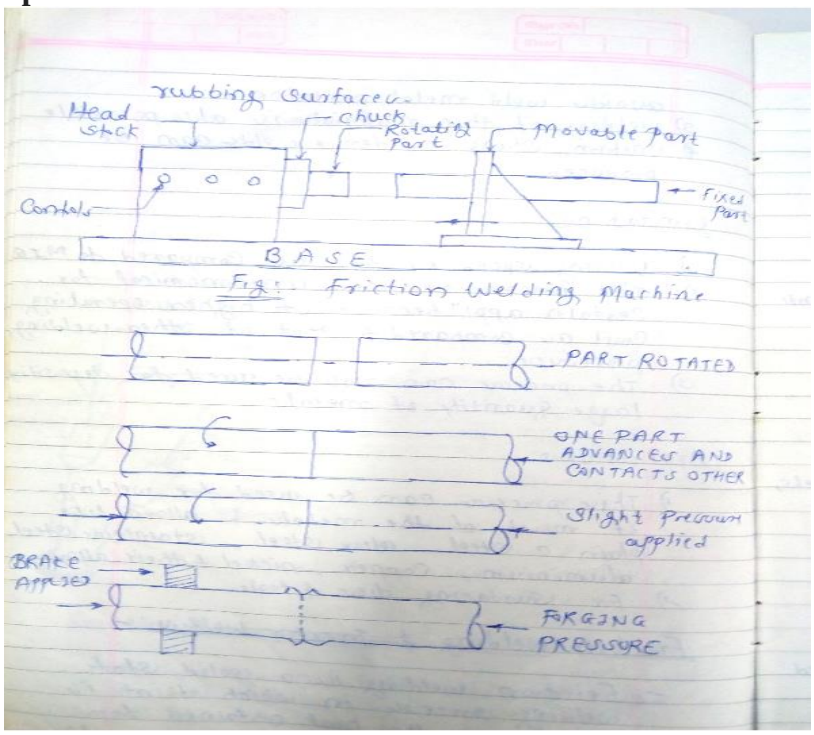
Electroslag Welding is a welding process, in which the heat is generated by an electric current passing between the consumable electrode (filler metal) and the work piece through a molten slag covering the weld surface.

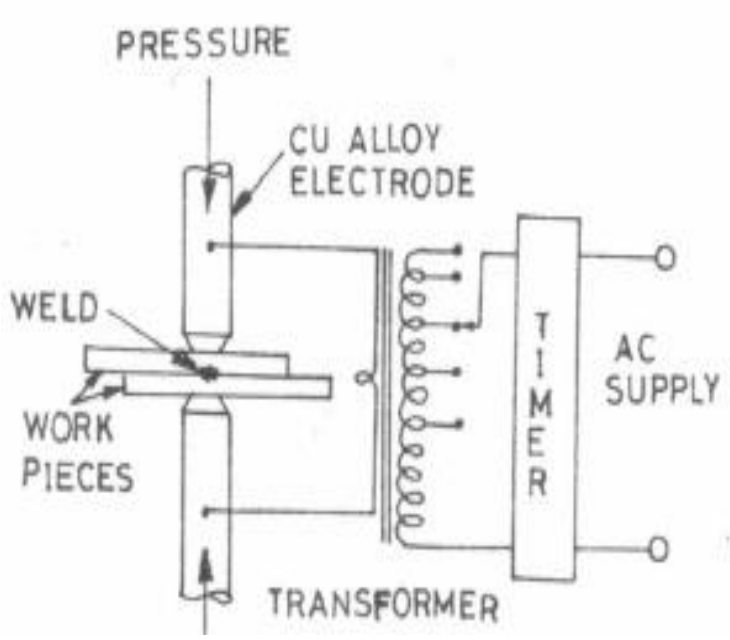
Prior to welding the gap between the two work pieces is filled with a welding flux. Electroslag Welding is initiated by an arc between the electrode and the work piece (or starting plate). Heat, generated by the arc, melts the fluxing powder and forms molten slag. The slag, having low electric conductivity, is maintained in liquid state due to heat produced by the electric current.

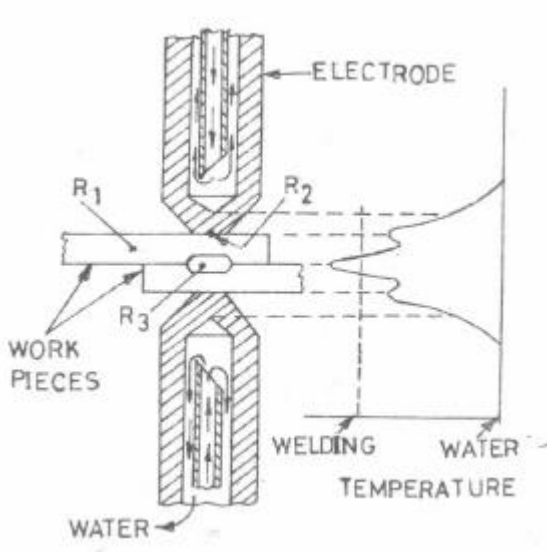
3m (working)

8m

	Advantages:- (i) Joint preparation is often much simpler than for other welding processes. (ii) Much thicker steels can be welded in single pass and more economically. Thicknesses up to 450 mm in plain and alloy steels can be welded without difficulty. (iii) Electroslag welding gives extremely high deposition rates. (iv)Residual stresses and distortion produced are low.	2m (2 advantage)	
Q.4.	**Attempt any TWO**	**8x2**	**16**
a. **Ans.**	 Working:(3M) • 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	3M (dia) 3m (working)	8m

	of flashes 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 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. **Advantages:-** 1. Low heat applications therefore minor changes in microstructure. 2. Welding of complicated geometry is possible. 3. Precise welding is possible. 4. Low thermal distortion. **5.** Low post weld operation is required.	2m (any 2)	
b.	**Principle:-** **Friction welding** (FRW) is a solid-state **welding** process that generates heat through mechanical **friction** between workpieces in relative motion to one another, with the addition of a lateral force called "upset" to plastically displace and fuse the materials. **Explanation:-**  	2m 2m (dia)	8m

	The two workpieces to be friction welded are held in axial alignment. One component is held in the chucking spindle of the machine is rotated and accelerated to the desired speed. The other component that is stationary & is held in a movable clamp is moved forward to come into pressure contact with the rotating component. Pressure & rotation are maintained until the resultant high temperature makes the components metal plastic for welding with sufficient metal. **Advantages:-** i) Simplicity of operation ii) Low power requirement. iii) Surface impurities & oxides are broken up & thrown off during the friction heating process. iv) There is no flux , gas, or filler metal is required.	2m(explain) 2m (any2)	
c. **Ans.**		2m	8m



2m

The two factors or variables mainly responsible for resistance welding are

1. The generation of Heal at the place where two pieces are to be joined.
2. The application of pressure at the place where a weld joint is to be formed.

1. Heat

- The heat, H, for electrical resistance welding is generated by passing a large electrical current (of the order of 3000 to 100,000 Amps with a voltage between 1 and 25 volts) through two pieces of metal that are touching each other.

4m

2.Resistance, R

- The total resistance of the system between the electrodes consists of

(i) The resistance of the workpiece R

(ii) The contact resistance between the electrodes and the work, R2, and

(iii) The resistance between the faying surfaces of the two metal pieces to be welded together, R3.

Q.5	Attempt any Two	8x2	16
a.	**The various causes of distortion are :**		
	1. More number of passes with small diameter electrodes.		8m
Ans	2. Slow arc travel speed.	3m	
	3. Type of joint. A V joint needs more metal to be deposited to fill the groove as compared to a U joint, thus leading to comparatively more distortion.	(any 3)	
	4. High residual stresses in plates to be welded.		
	5. Welding sequence being improper. Use of jigs and fixtures, clamps, presetting, wedging and proper tacking may minimize distortion.		
	The control of welding distortion:-		
	There are various practical ways for minimizing the distortion are:.	3m	
	1. Keep the contraction forces as low as possible by using only that amount of weld metal as is required by the joint. Another way to state this is do not overweld. The more the metal placed in a joint, the greater the contraction forces.	(any 3)	
	2. Use as few weld passes as possible - The more the number of passes, the more is resulting shrinkage (because shrinkage of each pass tends to be cumulative),and hence the distortion. Apply fewer passes with large electrodes. - Select electrodes for highest deposition efficiency.		
	3.Place welds near the neutral axis This reduces distortion by providing a smaller leverage for the shrinkage (contraction) forces to pull the plates out of alignment.		
	4. Balance welds around the neutral axis This will balance one shrinkage force against another. Design and welding sequence can be used to effectively control distortion.		
	5. Use of backstep welding or skip method of welding - With this welding technique, weld bead increments are deposited in the direction opposite to the progress of welding the joint e.g., each bead is deposited from right to left, but the welding progresses from left to right.		
	6 Make shrinkage forces work in the desired direction - Several assemblies can be preset out-of-position before welding so that the shrinkage forces will pull the plates into alignment. - Prebending or prespringing the parts to be welded is a simple example of the use of mechanically induded opposing forces to counteract weld shrinkage.		
	7 Welding sequences - Welding sequence implies the order of making the welds in a weldment. - The weld metal is placed at different points about the structure so that as it shrinks at one place it will counteract the shrinkage		

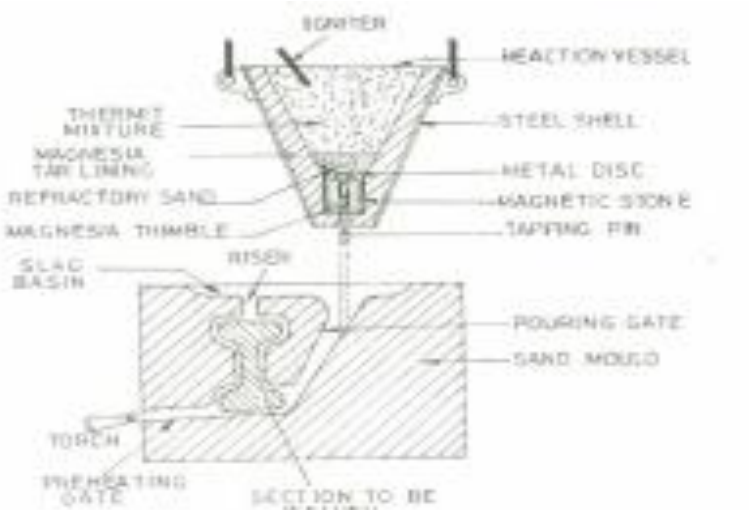
	forces of weld already made . **Relief of stresses:-** Relief of stresses are as follows **1 Thermal method:-** The thermal method involves changing the temperature of the entire part uniformly, either through heating or cooling. When parts are heated for stress relief, the process may also be known as stress relief bake. Cooling parts for stress relief is known as cryogenic stress relief and is relatively uncommon. **2 Stress relief bake:-** Most metals, when heated, experience a reduction in yield strength. If the material's yield strength is sufficiently lowered by heating, locations within the material that experienced residual stresses greater than the yield strength (in the heated state) would yield or deform. This leaves the material with residual stresses that are at most as high as the yield strength of the material in its heated state. Stress relief bake should not be confused with annealing or tempering, which are heat treatments to increase ductility of a metal. Although those processes also involve heating the material to high temperatures and reduce residual stresses, they also involve a change in metallurgical properties, which may be undesired. **3 Cryogenic stress relief:-** Cryogenic stress relief involves placing the material (usually steel) into a cryogenic environment such as liquid nitrogen. In this process, the material to be stress relieved will be cooled to a cryogenic temperature for a long period, then slowly brought back to room temperature. **4 Nonthermal methods:-** Mechanical methods to relieve undesirable surface tensile stresses and replace them with beneficial compressive residual stresses include shot peening and laser peening. Each works the surface of the material with a media: shot peening typically uses a metal or glass material; laser peening uses high intensity beams of light to induce a shock wave that propagates deep into the material. **5 Vibratory Stress Relief**, often abbreviated VSR, is a non-thermal stress relief method used by the metal working industry to enhance the dimensional stability and mechanical integrity of castings, forgings, and welded components, chiefly for two categories of these metal work pieces.	2m (any 2)	

b.	Difficulties incurred in welding of alloys 1. MAGNESIUM AND ITS ALLOYS I.An important characteristic of magnesium is its rapid oxidation when heated to its melting point in air. Shielding of molten metal pool with the help of inert gas or suitable fluxes, therefore is very necessary. II.Difficulties in welding magnesium arise from its high thermal conductivity and coefficient of thermal expansion which combine to cause severe stresses, distortion and even cracking unless precautions are taken. Faster welding speeds, smaller welding beads, holding parts in a jig, and the use of lower-melting point and lower shrinkage welding rods are beneficial. III.Mg-AI-Zn alloys, particularly those containing over 1% Zn are susceptible to hot cracking. For critical welding application (severe restraint, heavy sections, etc.), calcium free alloys should be specified. Moreover, welds in hot short alloys should be started away from the end of the seams. Magnesium alloys containing more than 1.5% Aluminium are susceptible to stress corrosion and residual stresses must be relieved. **2. COPPER AND ITS ALLOYS** (i) Higher thermal conductivity necessitates high heat input into the parent metal to raise the temperature sufficiently to produce the fusion desirable for most welding processes. High heat input is provided by using higher welding currents, gas nozzles with larger tips and by preheating the parts to be welded. (ii) Greater thermal expansion coefficients are responsible for the introduction of residual welding stresses in and around the welded joints. Residual stresses, however, can be minimized by preheating the base metal before welding and by slowing down the weld metal cooling rate by covering the welded joint with a heat insulating material such as asbestos. Suitable fixtures need be employed to minimize distortion when welding thinner workpieces. (iii) Copper has relatively low strength above 482"C, therefore, cracking may occur where severe stresses are introduced into the weldment. (iv) Copper has a tendency to absorb oxygen in molten state. Severe oxidation on heating to temperatures above 4000C offers difficulties in welding, since the oxides which form arc soluble in the molten weld metal. The presence of oxygen tends to reduce the melting point and corrosion resistance and decreases the mechanical properties, particularly the formability. Welded joints become brittle and porous. To avoid oxidation problem, a suitable flux or an inert gas is necessary	3m 3m	8m

	when welding copper. 3.**AI AND ITS ALLOYS** The first and the foremost consideration is the effect of the thin film of oxide which is always present on the surface of aluminium. This film contains moisture which may react during fusion welding, with the liquid metal in the weld pool, to form further oxide and to liberate hydrogen which can cause porosity. The oxide film on the surface of the base metal is removed chemically or mechanically (by brushing, scrubbing, etc.) before welding. The oxide film forms rapidly during welding also. This difficulty is overcome by I. Using a suitable flux in gas welding and brazing. II. Employing a suitable thickly coated electrode in metallic arc welding. Use of DCRP (electrode +) has been found effective for MIG	2m	
c. **Ans.**	Micro welding:- 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 work piece 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. Problems:- As Micro welding is a state of the art process that is used for welding small areas. Often the micro weld requires the surrounding area to be minimally effected by heat, requiring precise heating of the weld to only allow proper fusion of the joint. Micro welding requires the use of miniature TIG welding equipment (Gas Tungsten Arc) that is not much larger than a pen. Micro TIG welding is the latest in tool welding technology. Micro welding repairs—although not the rule—can still exhibit sink areas, fractures, separation of weld and other incidents	3m 3m	8m

	occasional to the TIG welding process. Methods:- GMAW GTAW Micro laser welding	2m (any 2)	
Q.6.	**Attempt any two**	**8x2**	**16**
a. **Ans.**	**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.	4m 4m	8m

b. **(i)** **Ans.**	**AWS D1.1:-** All standards (codes, specifications, recommended practices, methods, classifications, and guides) of the American Welding Society (AWS) are voluntary consensus standards that have been developed in accordance with the rules of the American National Standards Institute (ANSI). When AWS American National Standards are either incorporated in, or made part of, documents that are included in federal or state laws and regulations, or the regulations of other governmental bodies, their provisions carry the full legal authority of the statute. In such cases, any changes in those AWS standards must be approved by the governmental body having statutory jurisdiction before they can become a part of those laws and regulations. In all cases, these standards carry the full legal authority of the contract or other document that invokes the AWS standards. Where this contractual relationship exists, changes in or deviations from requirements of an AWS standard must be by agreement between the contracting parties. AWS American National Standards are developed through a consensus standards development process that brings together volunteers representing varied viewpoints and interests to achieve consensus. While AWS administers the process and establishes rules to promote fairness in the development of consensus, it does not independently test, evaluate, or verify the accuracy of any information or the soundness of any judgments contained in its standards. AWS disclaims liability for any injury to persons or to property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, or reliance on this standard. AWS also makes no guarantee or warranty as to the accuracy or completeness of any information published herein.	4m	4m
b **(ii)** **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.	4m	4m

	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 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.		
C i)	Robotic Gun Auto darkening welding helmates Pedestal boom manipulators Nozzle Electronic control unit Wire feed roller Electrode Hopper Welding filter lens	4m (any 4)	4
C ii)	**Dia:-**  Working:- **Exothermic welding**, also known as **exothermic bonding**, **thermite welding** (**TW**), and **thermit welding**, is a welding that employs molten metal to permanently join the conductors. The process employs an exothermic reaction of a thermite composition to heat the metal, and requires no external source of heat or current. The chemical reaction that produces the heat is an aluminothermic reaction between aluminium powder and a metal oxide. **Applications:-** Rail track repair work	2m (dia) 1m (explain) 1m (any 1)	4