

CBCS SCHEME

USN

ICR21ME007

21ME32

Third Semester B.E. Degree Examination, Jan./Feb. 2023 Metal Casting, Forming And Joining Processes

Max. Marks: 100

Time: 3 hrs.

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define pattern and explain with neat sketches any four pattern allowances. (10 Marks)
b. Explain with a neat sketch sand slinger. (10 Marks)

OR

- 2 a. Explain with a neat sketch investment moulding process. (10 Marks)
b. Explain in detail the procedure to determine the permeability member of green sand in foundry lab. (10 Marks)

Module-2

- 3 a. Explain with a neat sketch cupola furnace showing different zones. (10 Marks)
b. Explain with a neat sketch coreless induction furnace. (10 Marks)

OR

- 4 a. Explain with a neat sketch continuous casting process. (10 Marks)
b. Explain with a neat sketch any five casting defects. (10 Marks)

Module-3

- 5/ a. Explain the following yield criteria : (10 Marks)
i) Tresca yield criterion ii) Von Mises Yield criterion.
b. Explain temperature factor in metal forming and also write the comparison between hot working and cold working process. (10 Marks)

OR

- 6 a. Derive an expression for forging pressure and load by slab analysis. (10 Marks)
b. Explain the following sheet metal forming processes with neat sketch. (10 Marks)
i) Blanking ii) Piercing iii) Bending.

Module-4

- 7 a. Explain with a neat sketch Oxy-Acetylene gas welding process. (10 Marks)
b. Explain with a neat sketch types of flames produced in Oxy - Acetylene welding process. (10 Marks)

OR

- 8 a. Explain with a neat sketch Manual metal arc welding and also mention advantages disadvantages and applications. (10 Marks)
b. Explain with a neat sketch Metal Inert Gas (MIG) welding, mention its advantages, disadvantages and applications. (10 Marks)

Module-5

- 9 a. Explain with neat sketch shrinkage in welded structures. (10 Marks)
b. Explain with a neat sketch any five welding defects. (10 Marks)

OR

- 10 a. Write short note for the following : i) Soldering ii) Brazing. (10 Marks)
b. Explain with a neat sketch resistance spot welding process. (10 Marks)

MCW

Assignment

Name:- Darshan T. H.

U.S.N.:- ICRI9ME410.

Mechanical Engg.

"B" - sec.

1) with a neat diagram Explain Metal Arc welding?

→ The workpiece are joined by the heat obtained from an electric source b/w flux coated consumable electrode & the workpiece. the flux coated serve as a shielding gas to prevent atmospheric contamination of molten metal.

operation

a) An electrode holder, which holds the electrode firmly from one pole of the electric circuit while the to be welded from the other pole.

b) The metallic wire is coated with a suitable flux - material like rutile, calcium fluoride, cellulose, etc. which gives off gases as it decompose.

various benefits of flux coating include.

→ prevents oxidation of the molten metal.

→ stabilize the arc.

→ formation of slag.

c) In operation an arc is struck by touching the tip of the electrode on the workpiece.

d) The high heat at the tip of the arc melts the workpiece metal forming a small molten metal pool. At the same time, the tip of the electrode also melts.

e) The deposited metals fill the joint & bond the joint to form a single piece of metal.

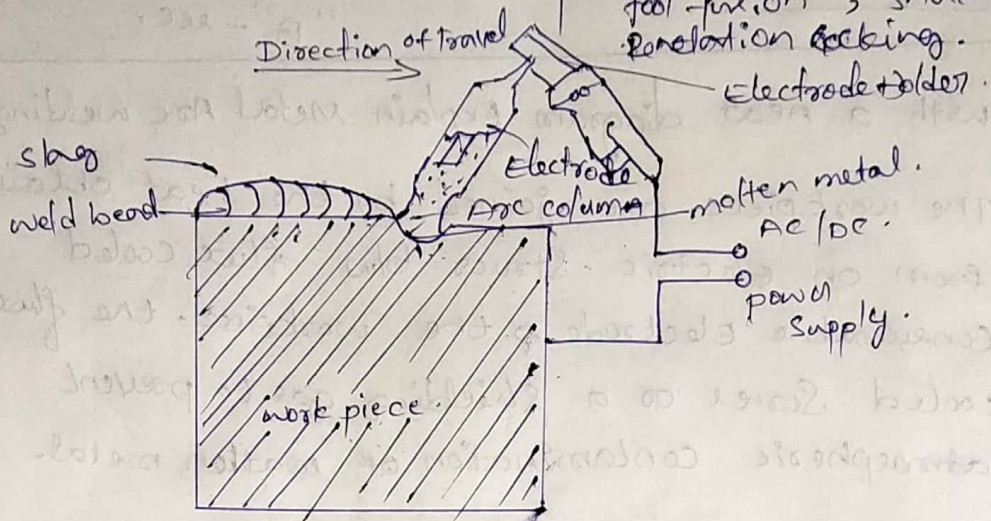
f) The arc is extinguished by increasing the arc length by widening the gap b/w the w/p & the electrode.

Advantages

- simple & Inexpensive.
- Eliminates skilled labour.
- less maintenance.

Disadvantages

- welding time is slow.
- defects like weld spatters, porosity, shallow penetration & cracking.



2.) Different between MIG and TIG welding?

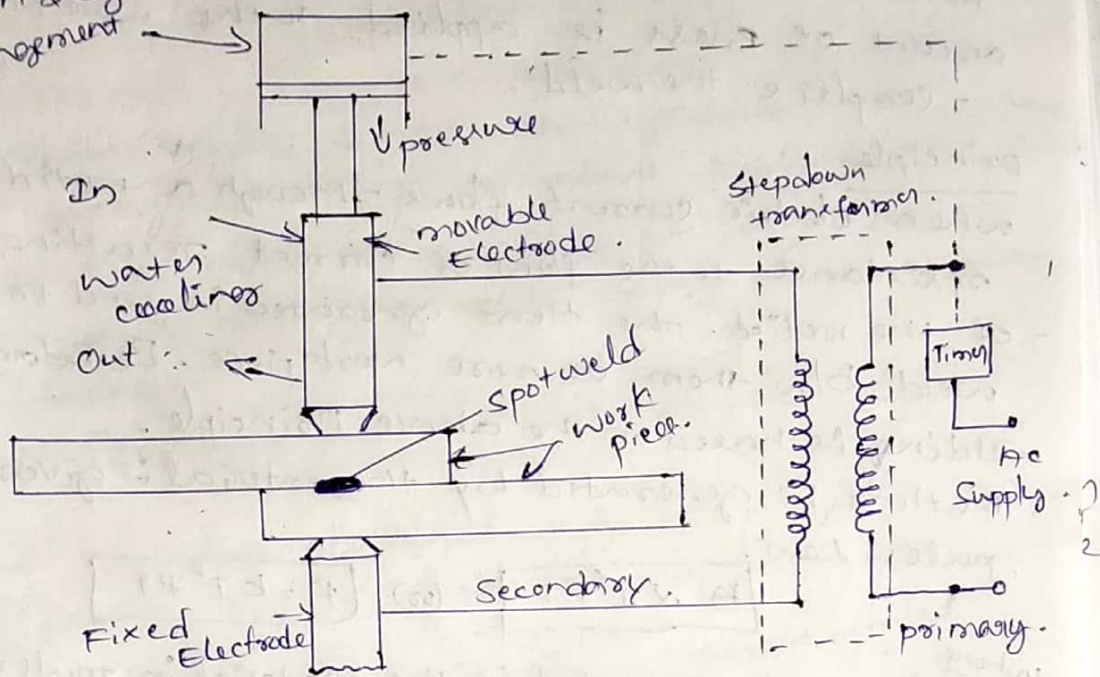
MIG welding	TIG welding.
a) welding rate is slow.	a) welding rate is high.
b) It is a difficult process.	b) It is simple.
c) consumable electrode.	c) non consumable electrode.
d) Both thin & thick metals can be welded.	d) only thin metal can be welded.
e) Ac is rarely used mostly Dc is used.	e) Both Ac & Dc current can be used depending on workpiece.
f) It is gas shielded tungsten arc welding.	f) It is gas shielded metal - Arc welding.

3.) with a neat sketch Explain Spot & Seam welding.

→ Spot welding :- Resistance spot welding is a resistance welding process in which fusion of two (or) more overlapping sheets of metal are held b/w electrode through which welding current is supplied for a definite time & supplied.

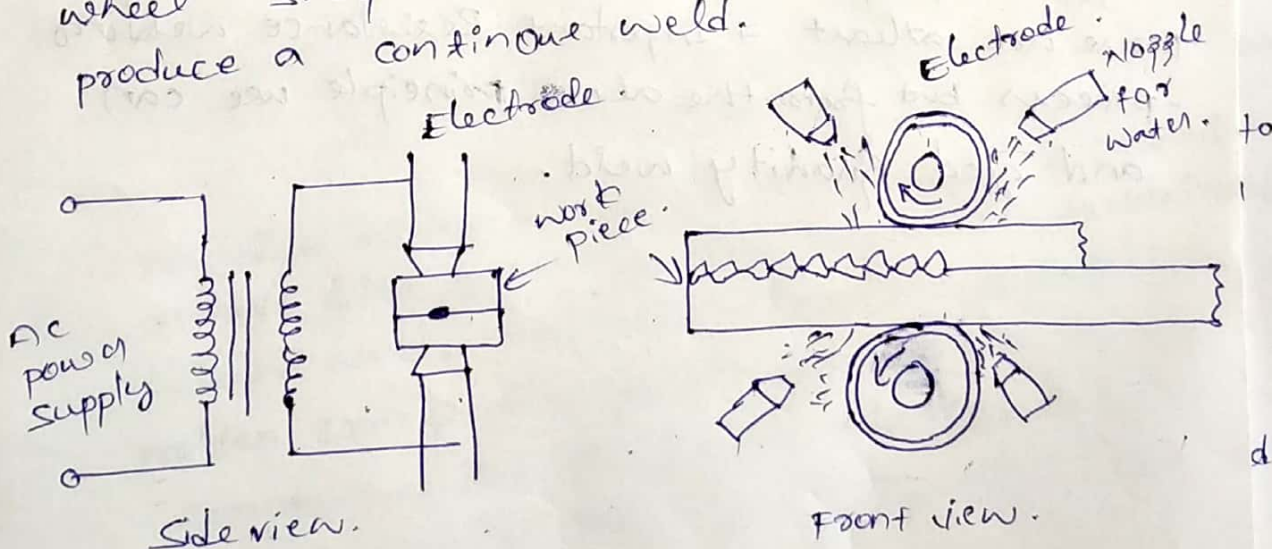
- for a definite time t also force is Exposed on work
- piece. The resistance to this current flow by weld
- metal causes the fusion at weld region & forms
- a joint at localized point called Spot weld.

Piston & cylinder arrangement



Seam welding.

It is a Resistance welding process in which the overlapping workpiece held under pressure be joined together by a series of spot welds made progressively along the joint utilizing the heat generated by the Electrode Resistance of the work piece. Instead of pointed Electrode mechanically driven wheel shaped Electrodes are used to produce a continuous weld.



4.) Explain the principle of Resistance welding?

→ Resistance welding is a process in which the workpiece are joined by the heat generated due to the Resistance offered by the work piece to flow of Electric current through them. A certain amount of current is applied to the workpiece to complete the weld.

principle.

When electric current flows through a material it offers resistance to the flow of current resulting in heating of the material. The heat generated is used to make a weld b/w them or more work piece. Resistance welding is based on the above principle.

The heat is generated by the material is given by Joules Law.

$$H \propto I^2 R T \quad (or) \quad H = k I^2 R T$$

where

H = Heat generated in the Material in joules.

I = flow of current through the material in Ampere

R = electrical Resistance of the material in ohm.

T = Time for which the electric current flows.

k = constant.

High current is the Resistance Requirement to produce a Resistance weld. A step down that converts the high voltage

low current over time to a high current

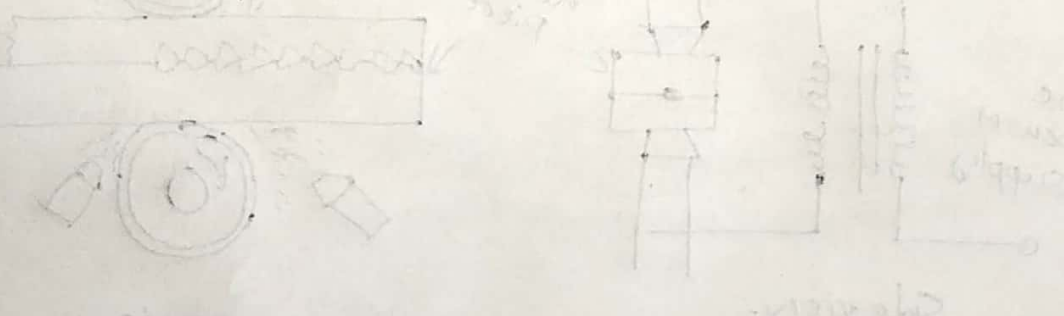
(upto 100,000A) & low voltage (0.5-10V) power is used

for the purpose.

These are at least 7 important Resistance welding

processes but from the above principle we can

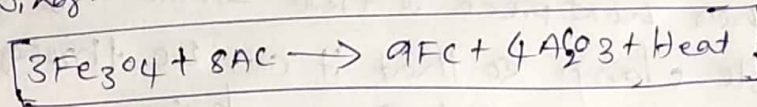
and good quality weld.



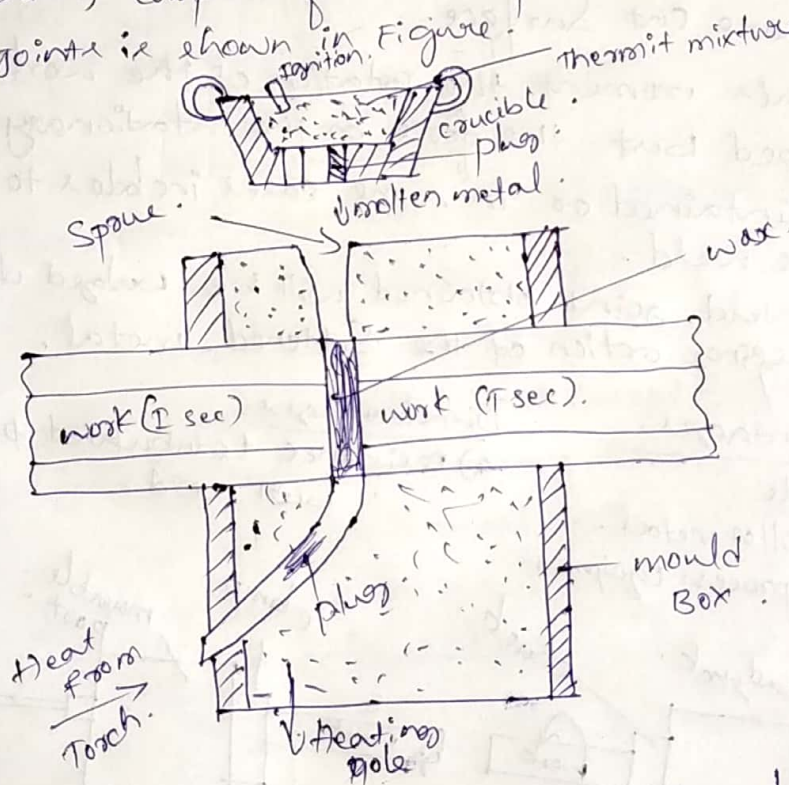
5.) With a neat sketch Explain thermit welding?

→ It is a fusion welding process in which the workpiece are joined by the heat obtained from a chemical reaction of the thermit mixture. Hence no of any rod be applied during the process.

The thermit mixture is a mixture of Iron oxide & Aluminium oxide, & when this mixture is brought to its ignition temp of about 1200°C reaction starts producing molten Iron & Slag (Al_2O_3) releasing amount of heat. The Reaction taking place is as per the following.

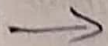


Molten Iron thus obtained is forced into the cavity upon solidification, complete fusion take place. The welding of the rail joints is shown in Figure.



The edge of the workpiece are cut flat & cleaned to remove dirt groove & other impurities to obtain a sound weld. Exothermic Reaction occurs to form molten Iron & Slag which float at the top. The temperature resulting from this Reaction is approximately 2500°C - the Reaction is allowed - a specific time.

6.) with a neat sketch Explain friction welding?



It is a solid state welding process in which the workpieces are joined by the heat generated due to the friction at the interface of the 2 workpiece.

The machine for friction welding is similar to lathe, which consists of a chuck held in the spindle of the headstock. the chuck holds one of the workpiece & rotate it at high speeds.

The other workpiece is held stationary in a moveable clamp so that it can be brought in contact with the rotating workpiece.

The workpiece to be joined prepared to have a smooth square cut surface.

At this moment the rotation of the workpiece is stopped but the force on the stationary is maintained or in some cases increased to complete the weld.

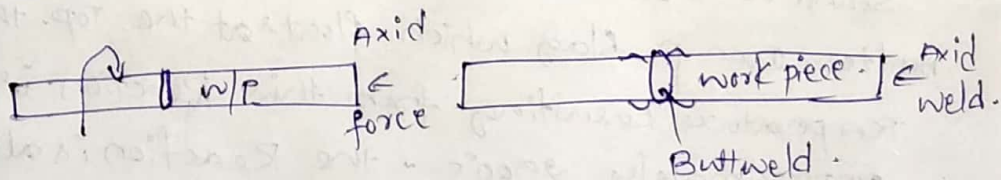
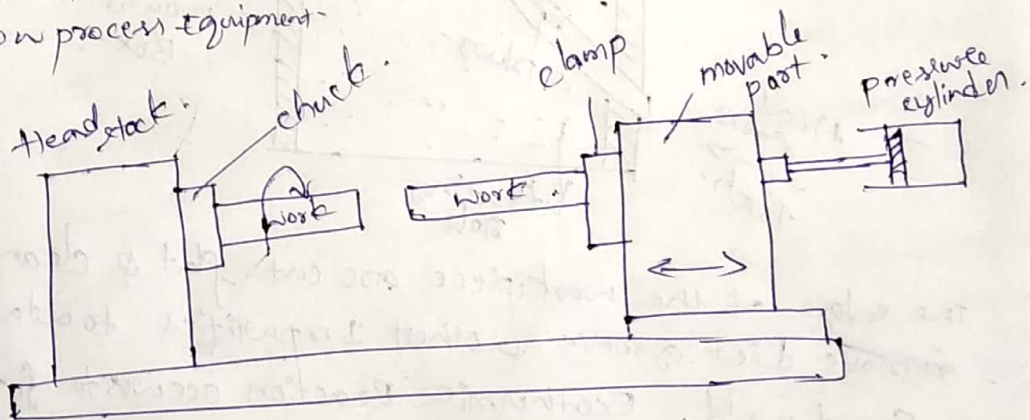
The weld joint obtained will be bulged due to squeezing action of the softened metal.

Advantages.

- a) Simple.
- b) No filler metal.
- c) Low process equipment.

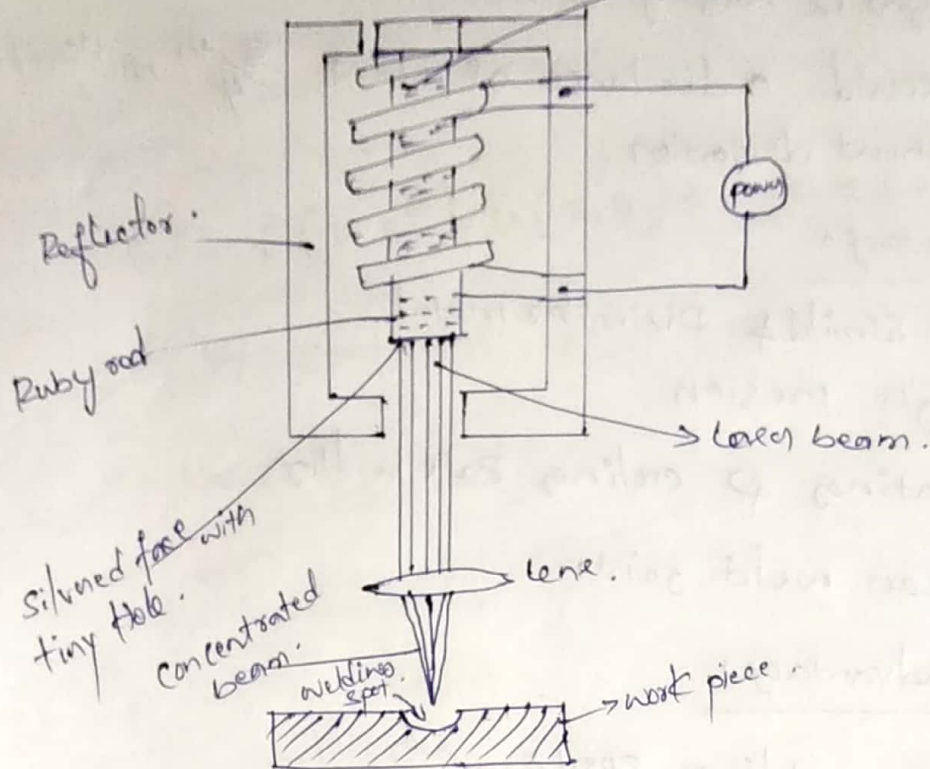
Disadvantages.

- a) Resistance to tubulated & butt weld.



7) Explain the principle of laser of operation & also
 - Explain laser welding.

→ Laser welding and laser operation ^{high silvered face.}



The laser stands for "Light amplification by Stimulated emission of radiation". Laser welding is a High Energy beam process & in this regard is similar to electron beam with that exception they are unlike one another. The Energy density of the laser is achieved by the concentration of light waves - not electrons. Laser is a beam of focused & concentrated monochromatic light. that has capable of travelling long distance without losing its intensity.

In laser welding heat obtained from the concentrated beam of light to focus on a small area on the work piece melt the base metal & cause welding actioned the joint.

- Light is nearly monochromatic.
 - coherent with smaller in phase with one another.
 - Laser Beam is Extremely Intense.
 - Light is highly collimated.
- It could a distance of about $\frac{3}{4}$ th million km - without deviation.

Advantages

- a) Both similar & dissimilar metal.
- b) High precision
- c) Heating & cooling rate is high.
- d) clean weld joints.

Disadvantages

- a) slow welding speed.
- b) Rapid cooling.
- c) High equipment cost.