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CMR INSTITUTE OF TECHNOLOGY, BENGALURU.
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Internal Assessment Test 2 – APRIL 2018

Sub:	Elements of Mechanical Engineering		Sub Code:	17 EME 24	Branch:	ALL Branches
Date: 17/04/2018	Duration: 90 min's	Max Marks: 50	sem./sec:	A,B,C,D,E,F,G		OBE

(ANSWER ANY FIVE)

		MARKS	CO	RBT
1.	a) Define: (i)Wet steam (ii) Dryness fraction (iii) Enthalpy of super-heated steam (iv) Degree of super heat	[06]	CO1	L1
	b) What is flux? State its advantages.	[04]	CO5	L1
2.	With the help of a temperature – enthalpy plot explain the formation of steam from water at 0ºC.	[10]	CO1	L2
3.	Briefly explain the construction and working of a Lancashire boiler with a neat sketch. Show the path of the flue gas.	[10]	CO1	L1
4.	Define: (answer any five) (i) Ice Making Capacity (ii) Ton of Refrigeration (iii) Coefficient of Performance (iv) Refrigeration (v) Air Conditioning (vi) Refrigerating Effect	[10]	CO2	L1

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5.	With a neat sketch, explain the construction and working of a window type air room conditioner.	[10]	CO2	L1
6.	(a) Explain the principle of electric arc welding with the help of a neat sketch.	[7]	CO3	L1
	(b) List the different types of oxy-acetylene flames and state its application.	[3]	CO3	L2
7.	Differentiate between welding, soldering and brazing	[10]	CO5	L2

5.	With a neat sketch, explain the construction and working of a window type air room conditioner.	[10]	CO2	L1
6.	(c) Explain the principle of electric arc welding with the help of a neat sketch.	[7]	CO3	L1
	(d) List the different types of oxy-acetylene flames and state its application.	[3]	CO3	L2
7.	Differentiate between welding, soldering and brazing	[10]	CO5	L2

1) a) Define :

i) Wet steam - A wet steam is defined as a two-phase mixture of entrained water molecules and steam is thermal equilibrium at the saturation temperature corresponding to a given pressure.

ii) Dryness fraction - The dryness fraction of a steam is defined as the ratio of mass of the actual dry steam present in a known quantity of wet steam to the total mass of the wet steam.

$$x = \frac{m_s}{m_f + m_s}$$

iii) Enthalpy of Superheated Steam - The enthalpy of Superheated steam is defined as the total amount of heat supplied at a given constant pressure to convert 1 kg of water at 0°c into 1 kg of superheated steam at the stated superheated temperature.

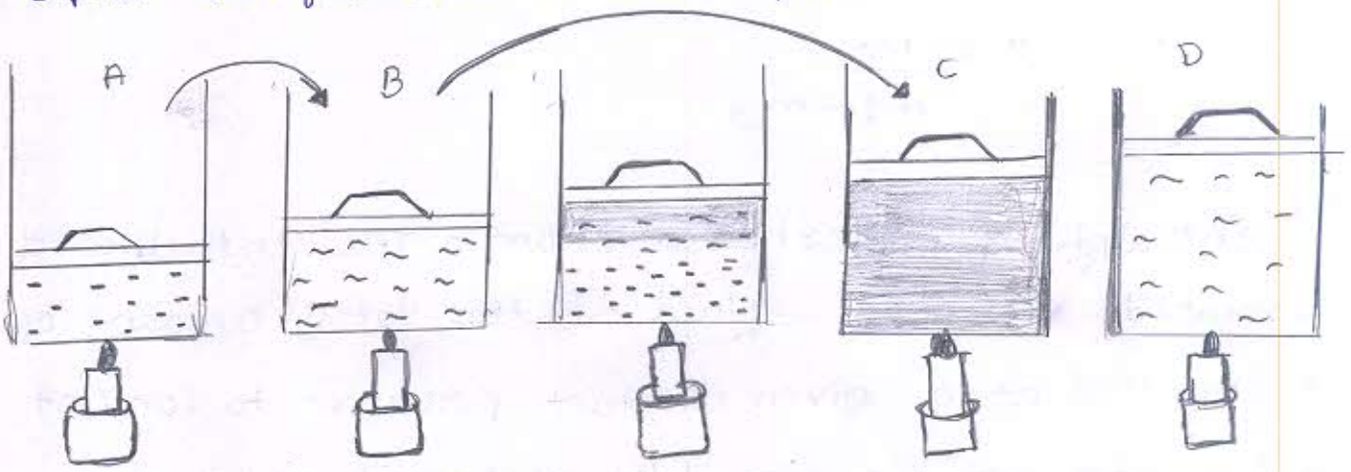
iv) Degree of Super heat - The difference between the superheated temperature and the saturation temperature is defined as degree of superheat.

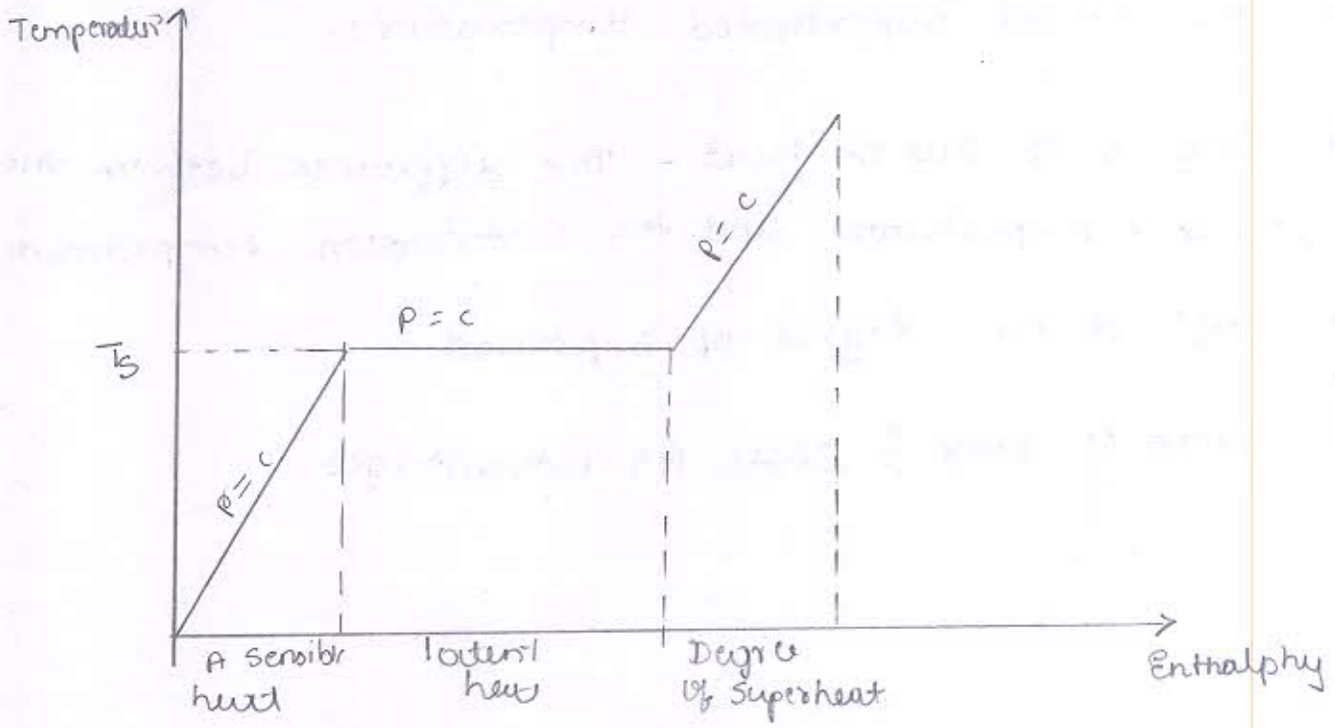
b) What is flux ? State its advantages.

Advantages of flux.

* It stabilizes the arc
* prvents oxidation of molten metal
* Hepls in Removal of oxides & other undesirable substances present on the surface of the workpiece
* Eliminates weld metal porosity.
* Helps to produce minimum spatter adjacent to the weld.

2. ~~What~~ With the help of a temperature - enthalpy plot explain the formation of steam from water at 0°C.





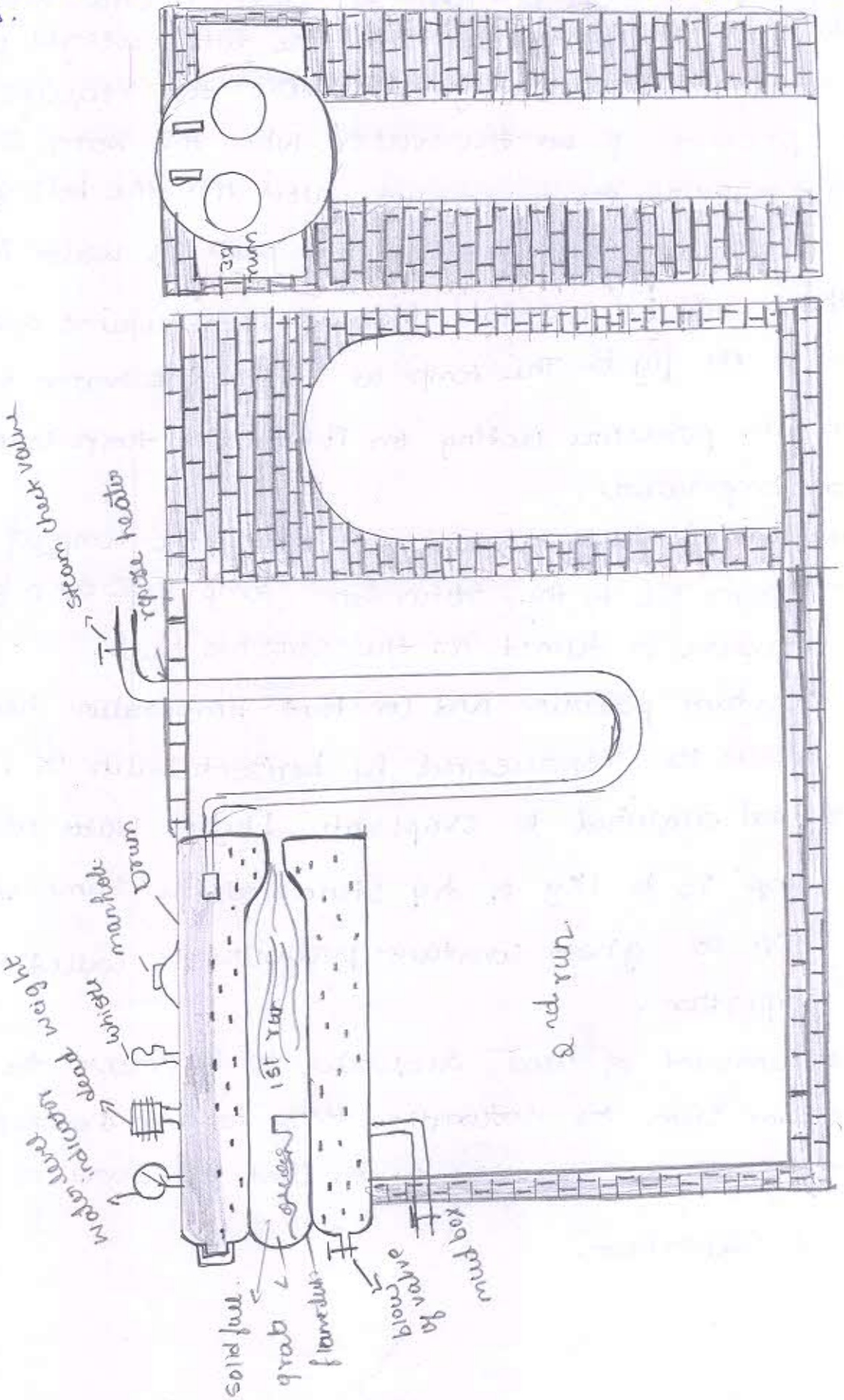
Consider 1 kg of water at 0°c taken in cylinder fitted with a freely moving frictionless piston. A chosen weight is placed over the piston so that the total weight of the piston and the chosen weight to exert the required constant pressure p on the water. When this water is heated at constant pressure, its temperature rises till the boiling point is reached. When the boiling point of water is reached, there will be a slight increase in the volume of water as shown in the fig B. The temp at which the water boils depends on the pressure acting on it. This is temp is called Saturation temperature.

The amount of heat required to raise the temp of 1kg of water from 0°C to the Saturation temp T_s°C out a given constant pressure is defined as the sensible heat.

The constant pressure and constant temperature heat addition proces is represented by horizontal line BC. The amount of heat required to evaporate 1 kg of water at Saturation temp T_s to 1kg of dry steam at the same saturation temp at given constant pressure is called latent heat of evaporation.

The amount of heat required to increase the temp of dry steam from its saturation temp to any desired higher temperature at the given Cont pressure is called amount of Superheat.

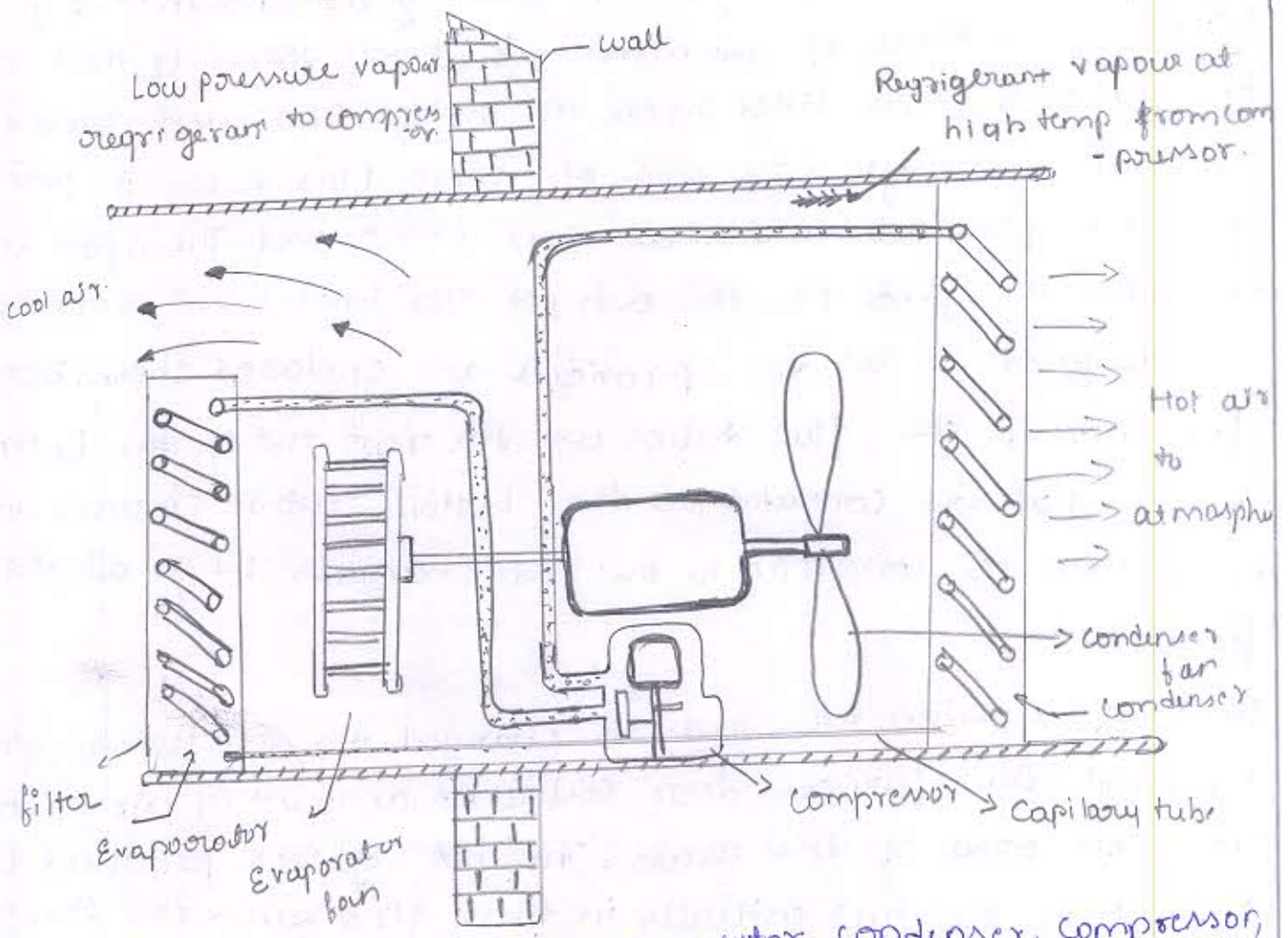
3. Briefly explain the construction and working of a Lancashire boiler with a neat sketch. Show the path of the flue gas.



4] ~~Define~~ The boiler consists of a horizontal cylindrical shell placed on a brick work setting as shown in fig. 2 large flue tubes of diameter about 0.4 times of that of the boiler shell are fitted inside the boiler shell and runs throughout its length. In each of these flue tubes 2 furnace grates are provided inside at their front end. The space underneath the grate is the ash pit. The brick work setting is designed so as to provided an enclosed chamber for each of the flue tubes at the rear end of the boiler shell, which are connected to the bottom central channel which in turn is connected to the side channels 1 & 2 at their front end.

Working :- When the fuel is charged on the furnace grates through the furnace door sufficient amount of air also enters the area of the grate. The hot gases produced by burning of the fuel initially in their first run. As these hot gases pass through the flue tubes heat transfer takes place from the hot gases to boiler. Now in their second run from the rear enclosed chamber they pass downwards and unite in the bottom central channel and travel from rear end to front end of the boiler. After passing along the bottom central channel, the hot gases divided at the ~~bottom centre~~ front end of the boiler shell and enter into the side channels 1 & 2. & for their third run pass through them to the rear end of the boiler.

5) With a neat sketch, explain the construction and working of a window type air room conditioner.

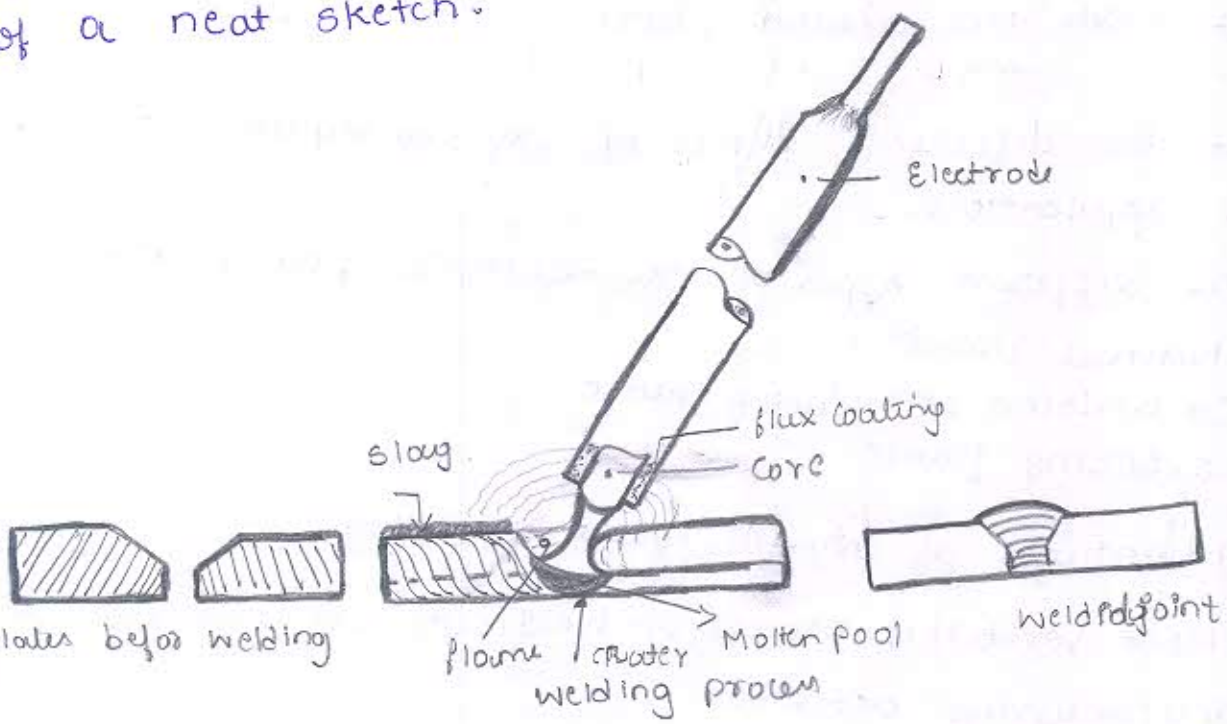


It mainly consists of an evaporator, condenser, compressor, two fans one each for the evaporator & condenser units usually driven by the single motor, capillary, etc.

The high-pressure, low-temp liquid refrigerant from the condenser is passed to the evaporator coils through the capillary tube where it undergoes expansion. The low-pressure, low temp liquid refrigerant passes through the evaporator coils. The evaporator-fan continuously draws the air from the interior space with the room through an air filter. The air from the interior passing over the evaporator coils is cooled by the refrigerant which consequently evaporates by absorbing the heat from the air. The high-pressure, high-temp refrigerant vapour now flows through the

Condenser coils. the condenser ~~unit over the condenses by giving off the heat of the atmosphe~~ cot condenser by coils. The ~~of~~ high-pressure, high-temp refrigerant passing inside the condenser coils condenses by giving off the heat to the atmo-spheric air. The cooled high-pressure refrigerant from the condenser passes through the capillary tube where it undergoes expansion & is again re circulated to repeat the cycle continu-ously.

6) a) Explain the principle of electric arc welding with the help of a neat sketch.



When two conductors of an electric circuit are touched toge-ther momentarily, & then instantaneously separated slightly, assu-ming that there is sufficient voltage in the circuit to maintain the flow of current, an electric arc is formed. Concentrated heat is produced throughout the length of the arc at a temp of about 5000 to 6000°C. In arc welding, usually the parts to be welded are wired as one pole of the circuit, and the electrode held by the operator form the other pole. When the arc is produced, the intense heat quic-kly melts the workpiece metal which is directly under the

the arc, forming a small molten metal pool. At the same time the tip of the electrode at the arc also melts, and this molten metal of the electrode is carried over by the arc, throughly mixing the base & the filler metal. A solid joint will be formed when the molten metal cools & solidifies. The flux coating over the electrode produces an inert gaseous shield surrounding the arc & protects the molten metal from oxidizing coming in contact with the atmosphere.

b) List the different types of oxy-acetylene flames & state its application.

The different types of oxy-acetylene flames are

* Neutral flame.
* Carburising or reducing flame.
* Oxidizing flame.

Advantages of Oxy-Acetylene Welding.

1. Most versatile process of welding with wide use in various manufacturing activities.
2. Low cost of the equipment & low cost of maintenance of the equipment.
3. The rate of heating and cooling is slow. This helps in retaining the structural homogeneous.

7. Differentiate between welding, soldering & brazing.

Soldering	Brazing	Welding.
* Incase of Soldering the metals are joined with the help of a filler metal with a low m.p, below 450°C, & below the m.p of the metals to be joined	* In case of Brazing, the filler metal has a melting temp of more than 450°C & upto 1000°C.	* In case of Welding, the surface to be joined are melted.
* Weaker joints compared to Brazing.	* Stronger joints compared to Soldering.	* Relatively stronger joints are produced.
* Economical process	* Not as economical	* Economical compared to Brazing.
* Average operator skill level is required	* Average operator skill level is required	* High operator skill & experience.

4) Define :

i) Ice Making Capacity - It is defined as the capacity of the Refrigerating system to make ice beginning from water to solid ice. It is usually specified by kg/hr.

ii) Ton of Refrigeration -

Refrigerating Effect - In a refrigeration system, the rate at which the heat is absorbed in a cycle from the interior space to be cooled is called refrigerating effect.

Refrigeration: It is defined as a method of reducing the temp of a system below that of the surroundings & maintains it at the lower temp by continuously abstracting the heat from it.

Air conditioning: Providing a cool congential indoor atmos-phere at all times regardless of weather conditions needed either for human comfort or industrial purpose by artificially cooling, humidifying or dehumidifying, cleaning & recirculating the surrounding air called air conditioning.

Co-efficient of performance

The co-efficient of performance of a refrigerant must be high so that the energy spent in refrigeration will be less.