



SNS COLLEGE OF TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

19MEB203 - THERMAL ENGINEERING

UNIT-V REFRIGERATION AND AIR CONDITIONING



TWO MARK QUESTION:

1. Define Tonne of refrigeration.

A tone of refrigeration is defined as the quantity of heat required to be removed from one tone of water at 0°C to convert that into ice at 0°C in 24 hour .In actual practices,

1 tonne of refrigeration = 210 KJ/min = 3.5KW.

2. Define Coefficient of Performance.

Co-efficient of performance is defined as the ratio of heat extracted or rejected to work input.

Heat extracted or rejected

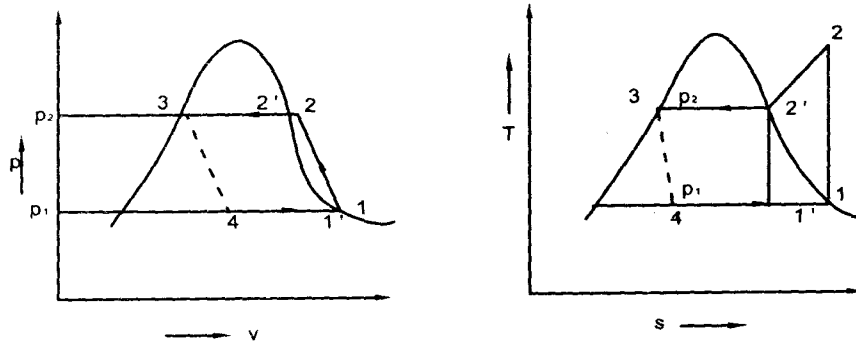
COP = -----

Work input

3. How does the actual vapour compression cycle differ from ideal cycle?

- In actual cycle, pressure losses occur in both condenser and evaporator.
- Friction losses occur in compressor

4. P-V and T-s diagram of vapour compression refrigeration system.



5. Name any four important properties of a good refrigerant.
 - a. Low boiling point
 - b. High critical temperature
 - c. High latent heat of vaporization
 - d. Low specific heat of liquid
 - e. Low specific volume of vapour
 - f. Non corrosive to metal
 - g. Non-Flammable and Non- Explosive
 - h. Non- toxic
 - i. Easy to liquefy at moderate pressure and temperature
 - j. Easy of locating leaks by odour or suitable indicator

6. Define heat pump.

A heat pump is a device, which is working in a cycle and transfers heat from lower temperature to higher temperature.

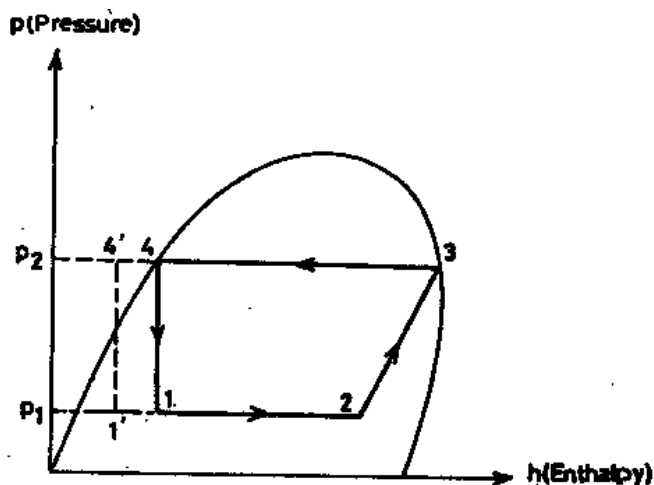
7. What is the difference between air conditioning and refrigeration?

Refrigeration is the process of providing and maintaining the temperature in space below atmospheric temperature.

Air conditioning is the process of supplying sufficient volume of clean air containing a specific amount of water vapour and maintaining the predetermined atmospheric condition within a selected enclosure.

8. What is sub cooling?

Sub-cooling is the process of cooling the liquid refrigerant below the condensing temperature for a given pressure. In the figure the process of sub-cooling is shown by 4-4'. As is evident from the figure the effect of sub-cooling is to increase the refrigerating effect. The sub-cooling results in increase of C.O.P. provided that no further energy has to be spent to obtain the extra cold coolant required.



9. What is the function of throttling valve in vapour compression refrigeration system?
The function of throttling valve is to allow the liquid refrigerant under high pressure and temperature to pass at controlled rate reducing its pressure and temperature.

10. Name any four commonly used refrigerants.

- Ammonia
- Carbon dioxide
- Sulphur di oxide
- Freon - 12

11. Why throttle valve is used in place of expansion cylinder for vapour compression refrigeration machine.

In throttling process, enthalpy remains constant and pressure is reduced so throttle valve is used.

12. What are the effect of superheat and sub cooling on the vapour compression cycle?

Superheating increase the refrigeration effect and COP may be increased or decreased. But sub cooling always increase the COP of the refrigeration and also decrease the mass rate of refrigerant.

13. What are the advantage and disadvantage of air refrigeration system?

ADVANTAGE:

- The refrigerant used namely air is cheap and easily available.
- There is no danger of fire or toxic effect due to leakages.
- The weight to tone of figuration ratio is less as compared to other systems.

DISADVANTAGE:

- The quantity of refrigerant used per tone of refrigeration is high as compared to other systems.
- The COP system is very low. Therefore running cost is high
- The danger of frosting at the expander valves is more as the contains moisture content.

14. What is net refrigerant effect of a refrigerant?

Refrigerating effect is the total load heat removed from the refrigerant in the evaporator.

$COP = \text{Refrigeration effect} / \text{work done.}$

15. What are the advantages of vapor compression refrigeration system over air refrigeration systems?

- The quantity of refrigerant used per tone of refrigeration is high as compared to other systems
- The COP of the system is very low. Therefore running cost is high.
- The danger of frosting at the expander valve is more as the air contains moisture content.

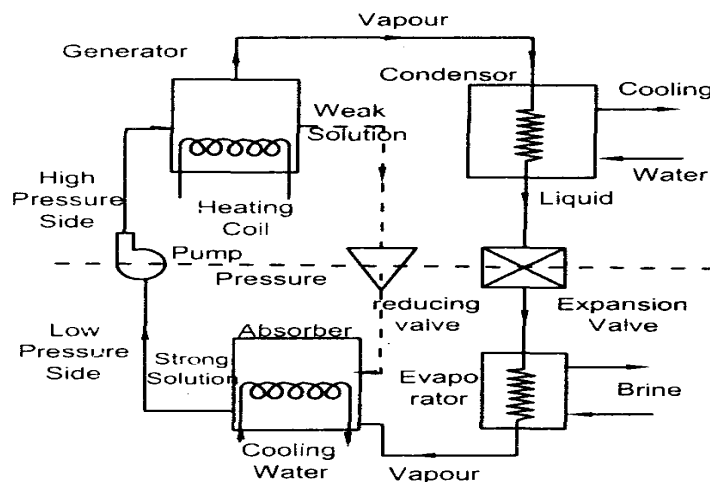
16. Define refrigerant.

Any substance capable of absorbing heat from another requirement substance can be used as refrigerant

17. What is the function of analyzer and rectifier in an absorption system?

Analyzer prevents water vapours from entering the condenser. This helps in preventing the chocking of pipelines. Even after passing through the analyzer, if any water vapours are present, that will be removed in the rectifier.

18. Name the various components used in simple vapour absorption system.



19. What is dew point temperature? How is it related to dry bulb and wet bulb temperature at the saturation condition?

It is the temperature at which the water vapour present in air begins to condense when the air is cooled. For saturated air, the bulb, wet bulb and dew temperature are all same

20. Define RSHF, RTH.

RSHF is the ratio of room sensible heat to the room total heat

$$\begin{aligned} \text{RSHF} &= \text{RSH} / \text{RTH} \\ &= \text{RSH} / (\text{RSH} + \text{RLH}) \end{aligned}$$

RTH is the sum of room sensible heat and room latent heat.

$$\text{RTH} = \text{RSH} + \text{RLH}$$

21. What factors affect bypass factor?

- Pitch of fins.
- Number of coil tubes.
- Air velocity over the coil.
- Direction of air flow.

22. State the effects of very high and a very low bypass factor.

VERY HIGH BYPASS FACTOR:

- It requires lower ADP. Refrigerant plant should be of larger capacity.
- It requires more air. Larger fan and motor required.
- It requires less heat transfer area.
- It requires more chilling water. Larger piping required.

VERY LOW BYPASS FACTOR:

- Higher ADP is to be employed.
- It requires less air. Fan and motor size required.

23. What are general comfort conditions during summer and winter?

SUMMER:

Inside temperature	24°C ± 1°C
RH	50-60%
Air movement	0.25 - 0.75 m/min

WINTER:

Inside temperature	20°C ± 1°C
RH	35-45%
Air movement	0.25 - 0.75 m/min

24. List down various methods of air distribution.

- (i) Under floor air distribution
- (ii) Combination overhead and under floor system
- (iii) Overhead air circulation.

25. What are the types of air filters?

- (i) Mechanical air filters
- (ii) Electronic air filters.

26. Define the term room air distribution.

The process of delivering air to and removed from spaces is known as room air distribution.

27. State the rule of multi-position fuzzy controller.

If temperature is low, then open humidifying valve slightly

If humidity is low , then open humidifying valve slightly.

28. Give an example for two position control mode.

A refrigerator in which the temperature drops below the set value , the compressor is turned ON. IF it is above the set value ,the compressor is turned OFF.

29. Define effective temperature (ET).

Effective temperature is defined as that temperature of saturated air at which subject would experience the same feeling of comfort as experienced in the actual unsaturated environment.

30. What factors affect effective temperature (ET).

- Climatic and seasonal differences.
- Clothing.
- Age and sex.
- Activity.
- Stay duration.
- Air velocity.

31. What are the requirements of comfort a/c?

- Supply of O₂ and removal of CO₂
- Removal of heat of occupants.
- Removal of moisture of occupants.
- Good air distribution.
- Maintaining air purity.

32. State the difference between direct expansion (DX) system and chilled water system of central air-conditioning.

In DX system, air to be conditioned is in direct contact with the refrigerant.

In chilled water system, refrigerant is used to chill water. This chilled water is in contact with the air to be conditioned.

33. Define bypass factor (BPF) of a coil.

The ratio of the amount of air which does not contact the cooling coil to the amount of supply air is called BPF.

$$\text{BPF} = \frac{\text{Amount of air by passing the coil}}{\text{Total amount of air passed}}$$

34. Define apparatus dew point of cooling coil.

For dehumidification, the cooling coil is to be kept at a mean temperature which is below the dew point temperature of the entering air. This temperature of the coil is called ADP temperature.

35. How does humidity affect human comfort?

If the humidity is above a certain level, water vapour from human body moisture cannot be absorbed by the atmospheric air. It results in discomfort because of sweating.