Q.16 Define refrigeration and its applications in different field.

Ans:
Refrigeration: "It is a process of maintaining lower temperature compared to surrounding temperature."
→ In order to maintain temperature continuously, refrigeration system must run on a cycle.

Applications of refrigeration:
1. Domestic refrigeration
2. Chemical refrigeration
3. Industrial refrigeration
4. Transport refrigeration
5. Air-conditioning.

Q.17 What are the different methods of refrigeration?

Ans:
(1) Natural refrigeration methods:
→ Natural ice for refrigeration
→ Evaporative cooling
(2) Artificial refrigeration methods:
→ Gas refrigeration System
→ Vapour compression refrigeration System
→ Vapour absorption System.

(3) Other refrigeration Methods:
→ Thermo-electric refrigeration System
→ Steam jet refrigeration System
→ Vortex tube refrigeration System
→ Magnetic refrigeration System.

Q.18 What is refrigerant & Discuss the classification of refr

Ans: Refrigerant: It is substance which is used for producing lower temperature.

Classification: In general refrigeration are of two types.
① Primary refrigerant
② Secondary refrigerant

① Primary refrigerant: The working medium which directly part in refrigeration system and cool the space by the ab of latent heat are called primary refrigerants.
Ex: Ammonia, SO_2, CO_2, etc.

② Secondary refrigerants:- These are circulating substance that are first with the help of primary refrigerant and th for cooling purpose.
Ex: ice, Solid CO_2, etc.

Q.19 Write the short notes on ozone depletion and global warming.

Ans: Ozone depletion:

- It is gradual thinning of earth's ozone layer in the upper atmosphere caused by the release of chemical compounds containing gaseous chlorine or bromine from industry and other human activities.
- Ozone depletion is a major environmental problem because it increases the amount of UV radiations that reaches the earth's surface, which increase the rate of skin cancer, cataracts, genetic and immune system damage.

Global Warming:

- "Global warming is a gradual increase in the earth's temperature generally due to greenhouse effect caused by increased level of Carbon dioxide, CFCs and other pollutants."

Q.20 Give the name of any four environment friendly refrigerants.

Ans: There are the following environmentally friendly refrigerants:

- Sulfur Dioxide
- Methyle chloride (R-40)
- Ammonia (R-717)
- Isobutane (R-600A)
- Isopropane (R 290)

Q.21 Explain the term 1 tonne of refrigeration.

Ans: "It is the amount of heat that is to be removed from one tonne of water at zero (0°c) in order to convert it into ice at 0°c in one day (24 hours)."

→ Tonne of refrigeration represents heat transfer rate.

1 T.R. = 3.5 KJ/s = 3.5 KW = 210 KJ/min

LECTURE - 15.

In this lecture we will discuss about refrigerator and heat pump.

→ Definition of refrigerator and heat pump

→ Differences between refrigerator and heat pump

→ Coefficient of performance (COP) of refrigerator and heat pump

→ Relation between $(COP)_R$ and $(COP)_{HP}$.

→ The fundamental reason for having a refrigerator is to keep food cold.

→ Cold temperature helps food stay fresh longer.

→ The basic idea behind refrigeration is to slow down the activity of bacteria so that it takes longer for the bacteria to spoil the food.

Q.22 Define Refrigerator and heat pump. [AKTU - 2020-21]

Ans: "Refrigerator is a cyclic device which is used to maintain lower temperature as compared to surrounding."

→ Refrigerator works on the Clausius statement.

$$(COP)_R = \frac{\text{Desired effect}}{\text{Work required}} = \frac{\text{Cooling effect}}{\text{Work input}}$$

$$\boxed{(COP)_R = \frac{Q_L}{W} = \frac{Q_L}{Q_H - Q_L}} \quad [W = Q_H - Q_L]$$

"Coefficient of performance (COP) of a refrigerator is the ratio of desired effect (cooling effect) and work input."

→ COP of refrigerator can be greater than unity.

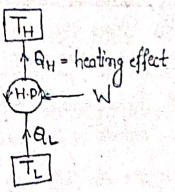
→ But efficiency of any device can not be greater than unity.

Heat pump: "It is a cyclic device which is used to maintain temperature as compared to surrounding."

→ Heat pump works on Clausius statement.

$(COP)_{H.P} = \frac{\text{Desired effect}}{\text{Work required}}$

$= \frac{\text{Heating effect}}{\text{Work input}}$



$$(COP)_{HP} = \frac{Q_H}{W} = \frac{Q_H}{Q_H - Q_L} \quad [W = Q_H - Q_L]$$

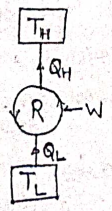
"Coefficient of performance of heat pump is defined as the ratio of desired effect (heating effect) and work input."

→ COP of heat pump can be greater than unity.

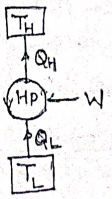
Q.23 Derive the relation between the COP of refrigerator and heat pump.

Sol: We know that

$$(COP)_R = \frac{Q_L}{Q_H - Q_L} \quad \text{---(i)}$$



and



$$(COP)_{HP} = \frac{Q_{HP}}{Q_H - Q_L} \quad \text{---(ii)}$$

Equation (ii) - (i)

$$(COP)_{HP} - (COP)_R = \frac{Q_H}{Q_H - Q_R} - \frac{Q_L}{Q_H - Q_R} = \frac{Q_H - Q_L}{Q_H - Q_L} = 1$$

$$(COP)_{HP} - (COP)_R = 1$$

OR

$$(COP)_{HP} = 1 + (COP)_R$$

→ This is the relation between COP of refrigeration and heat pump.

LECTURE - 16

In this lecture we will discuss about domestic refrigerator (Construction and working)

→ Basic reason for having a domestic refrigerator is to keep the food cold.

→ Cold temperatures help food stay fresh longer.

→ The basic idea behind refrigeration is to slow down the activity of bacteria (which all foods contain) so that it takes longer for the bacteria to spoil the food.

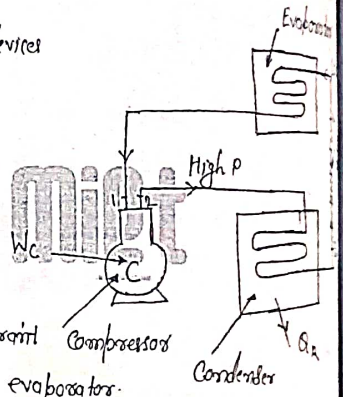
→ For example in summer bacteria will spoil the milk in two-three hours if the milk is left out in the kitchen at room temperature. However by reducing the temperature of milk, it will stay fresh for longer period.

Draw the neat diagram of a domestic refrigerator & its various parts. Explain its working also. [AKTU - 2020]

Ans: Refrigerator is a cyclic device which is used to maintain the temperature of Compared to Surrounding temperature.

These are the following basic parts of refrigerator:

1) Compressor
2) Condenser
3) Throttling / Expansion devices
4) Evaporator.



Working of refrigerator:

1. Compressor (1-2):

→ It is a mechanical device which transfer mechanical energy to working fluid i.e. refrigerant which is coming from evaporator.

→ Compressor raises the pressure and temperature of the

2. Condenser (2-3)

→ It is a type of heat exchanger.

→ The refrigerant enters into the Condenser from the Compressor

→ Condenser rejects the heat from working fluid (refrigerant) by means of Cooling coils made up of Copper

→ Due to heat rejection from refrigerant, it converts from gaseous state to liquid state.

→ After condensing refrigerant goes into the expansion devices.

3. Throttling / Expansion devices (3-4) :

→ In expansion valve the pressure and temperature decrease which comes from Condenser.

→ It also regulates the flow of refrigerant into the evaporator and maintains the flow rate equal to the rate of evaporation into the evaporator.

4. Evaporator (4-1) :→

→ Refrigerant comes from throttling devices enters into the evaporator at very low temp. and pressure.

→ In evaporator refrigerant goes through cooling coils and heat is absorbed by the refrigerant.

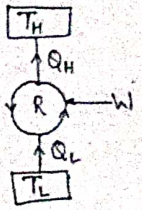
→ Due to absorption of heat liquid refrigerant converts into vapour and after that refrigerant enters into the Compressor.

→ This cycle repeats continuously.

LECTURE - 17

Formula based numerical Problems on cooling load.

$$(COP)_R = \frac{\text{Desired effect}}{\text{Work input}} = \frac{\text{Cooling effect}}{\text{Work input}}$$



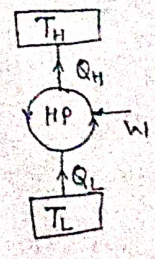
$$(COP)_R = \frac{Q_L}{W} = \frac{Q_L}{Q_H - Q_L}$$

OR

$$W = Q_H - Q_L$$

$$(COP)_R = \frac{T_L}{T_H - T_L} \quad [T \text{ in } K]$$

$$(COP)_{HP} = \frac{\text{Heating effect}}{\text{Work input}}$$



$$(COP)_{HP} = \frac{Q_H}{W} = \frac{Q_H}{Q_H - Q_L}$$

OR

$$(COP)_{HP} = \frac{T_H}{T_H - T_L} \quad T \text{ in } K$$

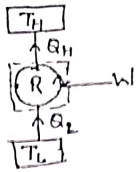
$$(COP)_{HP} = (COP)_R + 1$$

$COP \uparrow \Rightarrow W \downarrow \Rightarrow Cost \downarrow$

Q.25 The food compartment of a refrigerator is maintained at 4°C by removing heat from it at a rate of 360 KJ/min. If the required power input to the refrigerator is 2KW, determine <a> the COP of refrigerator <b> the rate of heat rejection to the room.

Solution

Given data: $Q_L = 360$ KJ/min
$= 360/60$ (KJ/s)
$= 6$ KJ/s
or
$Q_L = 6$KW



$W = 2$KW

<a> $(COP)_R = ?$ <b> $Q_H = ?$

We know

$(COP)_R = \frac{Q_L}{W} = \frac{6\ KW}{2\ KW} \Rightarrow \boxed{(COP)_R = 3}$ Ans

<b> $Q_H = W + Q_L \Rightarrow Q_H = 2 + 6 \Rightarrow \boxed{Q_H = 8KW}$ Ans

Q.26 A heat pump has a COP of 1.7. Determine the heat transferred to and from this heat pump when 50KJ of work is supplied.

Solution Given data:

$(COP)_{HP} = 1.7$

$W = 50$KJ

<a> $Q_L = ?$ <b> $Q_H = ?$

We know that

$(COP)_{HP} = \frac{Q_H}{W} \Rightarrow 1.7 = \frac{Q_H}{50KJ}$

$\Rightarrow \boxed{Q_H = 85\ KJ}$ Ans

Also we know

$Q_H = W + Q_L \Rightarrow 85 = 50 + Q_L$

$\Rightarrow \boxed{Q_L = 35\ KJ}$ Ans

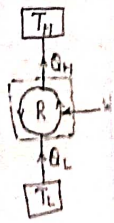
Q.27 A domestic food freezer maintains a temp. of -15°C. The ambient air temperature is 30°C. If heat leaks into the freezer at the continuous rate of 1.75 KJ/s. What is the power necessary to pump this heat out?

Solution:

Given data: $T_L = -15°C = 258\ K$

$T_H = 30°C = 303\ K$

$Q_L = 1.75$ KJ/s



Min power = $W_{min} = ?$

We know that

$(COP)_{R_{max}} = \frac{T_L}{T_H - T_L} \Rightarrow (COP)_{R_{max}} = \frac{258}{303 - 258}$

$\boxed{(COP)_{R_{max}} = 5.73}$

Also we know that

$$(COP)_{R,max} = \frac{Q_L}{W_{min}} \Rightarrow W_{min} = \frac{Q_L}{(COP)_{R,max}}$$

$$\Rightarrow W_{min} = \frac{1.75}{5.73}$$

$$\Rightarrow \boxed{W_{min} = 0.305\ KJ/s}$$ Ans

Q.28 Find the coefficient of performance and heat transfer rate in the condenser of a refrigerator in KJ/h which has a refrigeration capacity of 12000 KJ/h when power input is 0.75KW.

Solution

Given data:

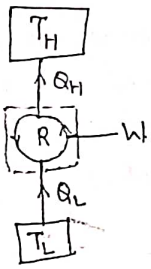
$\boxed{Q_L = 12000\ KJ/h}$

$W = 0.75KW$

or

$W = 0.75 \times 3600\ (KJ/h)$

$\boxed{W = 2700\ KJ/h}$



(a) $(COP)_R$ = ? (b) Q_H = ?

We know that

$$(COP)_R = \frac{Q_L}{W} \Rightarrow (COP)_R = \frac{12000\ (KJ/h)}{2700\ (KJ/h)}$$

$$\Rightarrow \boxed{(COP)_R = 4.4}$$ Ans.

Also, $Q_H = W + Q_L \Rightarrow Q_H = 2700 + 12000 \Rightarrow \boxed{Q_H = 14700\ KJ/h}$ Ans

Q.29 A fish freezing plant requires 40 tons of refrigeration. The freezing temperature is -35°C while the ambient temperature is 30°C. If the performance of plant is 20% of the theoretical cycle working within the same temperature limits, calculate the power required.

Solution:

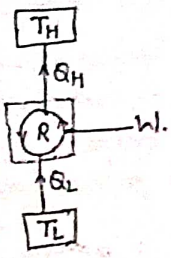
Given data: $Q_L = 40$ tons

$T_L = -35°C = 238K$

$T_H = 30°C = 303K$

$(COP)_{act} = 20\%$ of $(COP)_{ideal}$

To find: power = W = ?



$\because$ 1 T.R = 3.5 KJ/s

$\therefore Q_L = 40 \times 3.5 \Rightarrow \boxed{Q_L = 140\ KJ/s}$

$$(COP)_{max} \text{ or } (COP)_{ideal} = \frac{T_L}{T_H - T_L} = \frac{238}{303 - 238}$$

$$\boxed{(COP)_{ideal} = 3.67}$$

$$\Rightarrow (COP)_{act} = 0.2 \times 3.67$$

$$\Rightarrow \boxed{(COP)_{act} = 0.734}$$

We know

$$(COP)_{act} = \frac{Q_L}{W} \Rightarrow 0.734 = \frac{140}{W} \Rightarrow \boxed{W = 191.7\ KJ/s}$$ Ans

LECTURE - 18

In this lecture we will discuss about air-conditioning

→ Definition of air-conditioning
→ Different applications of air-conditioning
→ Difinitions of atmospheric air, dry air, wet air.
→ Air-conditioning is an important part of human life, day by day environment that we live-in is in verge of pollution overtake.
→ It is important to us we breathe good quality of air.
→ The air in the earth's atmosphere is made up of approximately 78% Nitrogen and 21% Oxygen.
→ Air also has small amount of other gases i.e. Carbon dioxide, neon and hydrogen.

Q.30 Define the term 'air-conditioning'.

Ans: Air-conditioning is a process of controlling air temperature, humidity, ventilation, filtration and air circulation in a space (a space in a Building or Vehicle)

Q.31 What are the different application of air-conditioning?

Ans: These are the following applications of air-conditioning
→ Residential and office buildings.
→ Hospitals and cinema halls.
→ Libraries, museums, computer centers.
→ Transport vehicle: Car, bus, aircraft etc.
→ Food and process industries.
→ Production shop laboratories.

LECTURE - 19

In this lecture we will discuss about psychrometry

→ Definition of psychrometry

→ Psychrometric properties
- Specific humidity.
- relative humidity
- Dry bulb temperature
- Wet bulb temperature
- Dew point temperature

→ Psychrometry is the study of air-water mixture

→ The properties of moist air are called psychrometric properties.

→ In psychrometry, a psychrometer comprises of a dry bulb and wet bulb thermometer.

Q.32 Define the following terms:
(i) Atmospheric air (ii) Dry air (iii) Wet air

Ans:
(i) Atmospheric air: Air in the atmosphere normally contains some water vapour (moisture), number of pollutants and referred as atmospheric air.

(ii) Dry air: It is a mixture of nitrogen, oxygen and small amounts of some other gases.

(iii) Wet air: It is air that contains the highest level of water vapour. Wet air is also known as saturated air.

Imp
Q.33 Define the following:
(i) Specific humidity (ii) Relative humidity.

Ans:
(i) Specific humidity (W): It can be defined as the mass of water vapour present in a unit mass of dry air

$$W = \frac{\text{mass of w.v}}{\text{mass of d.a}}$$

$$W = \frac{m_v}{m_a}$$ Unit: kg of water vapour / kg of dry air

where m_v = mass of water vapour
m_a = mass of dry air

$$\omega = \frac{m_v/V}{m_a/V} = \left[\because v = \frac{V}{m}\right]$$

where, V = total volume

v_v = Specific volume of water vapour

v_a = Specific volume of dry air

$$\boxed{\omega = \frac{v_a}{v_v}}$$

→ Specific humidity is also known as absolute humidity or humidity ratio.

(ii) Relative humidity (ϕ) :- It is a measure of how much water vapour is in a water-air mixture compared to the maximum amount possible.

$$\phi = \frac{\text{Actual mass of water vapour in a given volume}}{\text{Maximum mass of water vapour in a given volume}}$$

V. Imp.

Q. 84 Define following

(i) Psychrometry (ii) Dry bulb temperature

(iii) Wet bulb temp (iv) Dew point temperature

Ans:

(i) Psychrometry :-

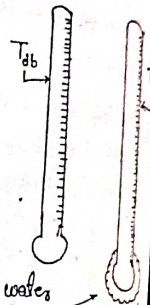
→ Moist air is the mixture of water vapour and dry air

→ The properties of moist air are called psychrometric properties

→ "The science in which we deal with the psychrometric properties is known as psychrometry."

(ii) Dry bulb temperature (T_{db} or T) :-

The dry bulb thermometer has bare bulb which is directly exposed to air and measure the actual temperature which is called dry bulb temperature and denoted by "T_{db}" or "T".



(iii) Wet bulb temperature (T_{wb}) :

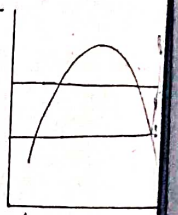
→ The bulb of wet bulb thermometer is covered by a wick thoroughly wetted by water

→ The temperature which is measured by the wet wick covered bulb is known as wet bulb temperature

(iv) Dew point temperature (T_{dp}) :

→ The air in atmosphere contains moisture (water vapour)

→ If we reduce the temperature of air at constant pressure, moisture get condense.



→ The temperature at which first drop of dew is formed or condensation begin when the air is cooled at constant pressure is known as dew point temperature and is denoted by T_{dp}.

LECTURE - 20

In this lecture we will discuss working of window type air-conditioner and conditions for human comfort.

→ There are mainly two types of air-conditioner i.e. window and split AC.

→ As per the syllabus we will discuss the working of window air-conditioner only.

→ Air-conditioning is an important part of human life.

→ Environment that we live-in is getting polluted.

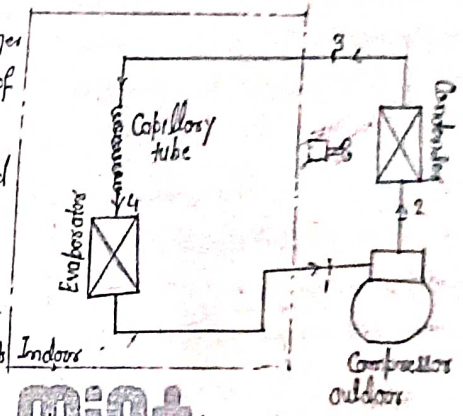
→ Air-conditioner is important to us to breathe good quality of air.

→ It is process of controlling air temperature, humidity, ventilation and filtration of air.

Q.35 With the help of neat sketch describe the working of window type air-conditioner [AKTU- 2020-21].

→ Window air-conditioner is the simplest form of an air conditioning system and is mounted on windows or walls.

→ It is a single unit that is assembled in casing where all the components are located.



→ Compressor, condenser, throttling/capillary tube, evaporator are its main components.

1. Compressor (1-2)

→ The refrigerant enters the compressor at low temperature and pressure in a gaseous state.

→ In compressor, temperature and pressure of refrigerant increases.

→ The refrigerant leaves the compressor in gaseous state and entered into the condenser.

→ Since process in compressor requires work, an electric motor may be used.

2. Condenser (2-3) :- It is a kind of heat exchanger in which refrigerant of high pressure and temperature enters which is coming from compressor.

→ The function of the condenser is to transfer heat from the refrigerant to another medium such as air.

→ By rejecting heat, the gaseous refrigerant condenses to liquid inside the condenser

3. Capillary tube (3-4):

→ High pressure refrigerant from the condenser enters the throttling device, the pressure and temperature of refrigerant drops down.

→ Capillary tube (throttling valve) also controls the amount of the refrigerant flowing through it.

4. Evaporator (4-1)

→ It is also a kind of heat exchanger in which refrigerant of low pressure and temperature enters which is coming from throttling valve.

→ The function of the evaporator is to absorb heat by the refrigerant from the space to be cooled.

→ By absorbing heat, the refrigerant converts from liquid state to gaseous state.

→ Filter Drier :- is used to remove the moisture from the refrig

→ Drain Pan :- is used to contain the water that condenses from cooling coil and is discharged out to the outdoors.

→ Propeller fan :- is used in condenser to help move the air over the surface of the condensing coil.

A window air-conditioner is normally specified by:

→ Capacity : 1, 1.5 and 2 ton etc.

→ Overall dimensions : length x width x height

→ Power Supply : AC, 220-240 volts

→ Control : Site or remote

Q.26 Explain the human comfort. What are the conditions for comfort air-conditioning ?

Ans:

→ Human comfort refers to the control of temperature and humidity of air and its circulation.

→ So that the resulting environment becomes human friendly. General human comfort conditions are to be maintained under

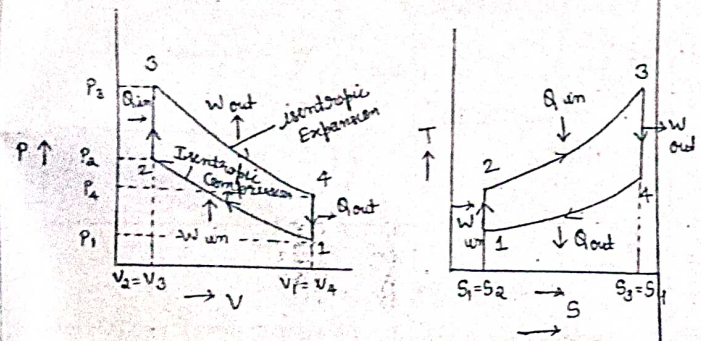
→ Temperature : 22°C to 27°C

→ Relative humidity 40% to 60%

→ Air velocity 5 m/min to 8 m/min.

Give a neat Sketch of the theoretical and actual P-V & T-S diagram for a four-Stroke petrol engine (otto Cycle)

otto Cycle, with the help of P-V & T-S diagram we can easily understand all the process of otto Cycle



P-V & T-S diagram of atto Cycle

1 process 1-2: Isentropic Compression (Reversible adiabatic Compression)

This process involves motion of piston from TDC to BDC. The air that is sucked into Cycle during Suction Stroke, Since the air is Compressed, the pressure increases from P_1 to P_2, the Volume decreases from V_1 to V_2, temperature rises from T_1 to T_2 and entropy remains Constant

2. process 2-3 Heat Addition at Constant Volume

In this process when piston reaches at TDC heat is added at Constant Volume. Due to heat addition pressure increases from P_2 to P_3, Volume remains Constant ($V_2=V_3$), temperature increases from T_2 to T_3 and entropy increases from S_2 to S_3

The amount of heat added is given by

$$Q_1 = mC_v(T_3-T_2)$$

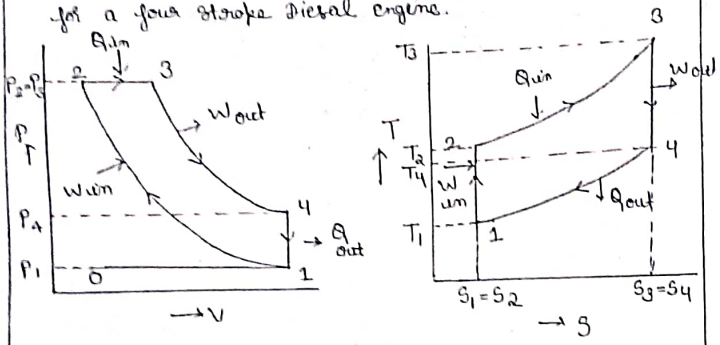
3. process 3-4 Isentropic expansion (Reversible adiabatic expansion)

piston moves from TDC to BDC, this process involves expansion of air, pressure decreases from P_3 to P_4, Volume increases from V_3 to V_4, temperature falls from T_3 to T_4 and entropy remains unchanged ($S_3=S_4$)

4. process 4-1 Heat Rejection at Constant Volume

In this process heat rejection takes place at Constant Volume, pressure decreases from 4 to 1 Volume remains Constant (i.e $V_4=V_1$), temperature falls from (T_4 to T_1)

Give a neat Sketch of theoretical P-V and T-S diagram for a four Stroke Diesal engine.



process 0-1 (Suction Stroke.)

process 1-2 Isentropic Compression

When piston moves BDC to TDC air compression takes place isentropically. So pressure increases from P_1 to P_2 Volume decreases from V_1 to V_2, temperature increases from T_1 to T_2

process 2-3 Heat addition at Constant Volume

In this process pressure remains Constant (i.e $P_2=P_3$) Volume increases V_2 to V_3, temperature increases T2 to T3 entropy increases from S_2 to S_3.

process 3-4 Isentropic Expansion

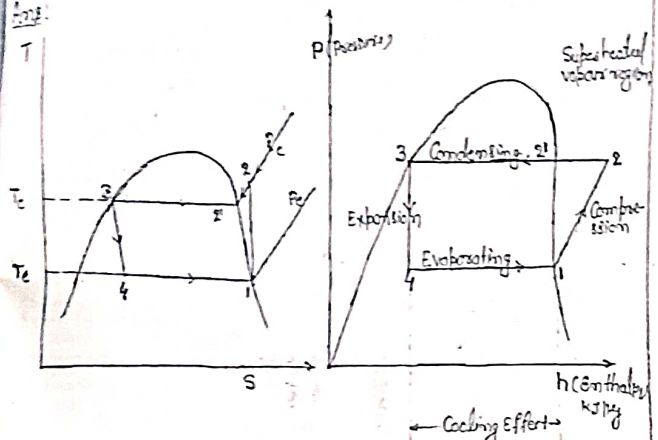
In this process the expansion of air takes place isentropically and work is obtained. pressure falls from P_3 to P_4, Volume increases from V_3 to V_4, temperature falls from T_3 to T_4 and entropy remains Constant ($S_3=S_4$)

process 4-1. Constant Volume Heat Rejection

In this process heat rejection takes place at Constant Volume. The pressure decreases from P4 to P1 temperature decreases from T_4 to T_1, entropy decreases from S_4 to S_1 and Volume remains Constant (i.e V_4 to V_1)

Q. Describe, with the help of schematic T-S and p-h diagram of vapour compression refrigerating system.

Ans:



In Compression (During process 1-2 : Isentropic Compression)
* Inlet is low pressure, low temperature, Saturated vapour
* Outlet is high pressure, high temperature Saturated / Superheated vapour

In Condenser (During process 2-3, Isobaric heat rejection)
* Inlet is high pressure, high temperature, Saturated / Superheated vapour
* Outlet is high pressure, low temperature Saturated liquid

In expansion device (During process 3-4 : Ilenthalpic expansion)
* Inlet is high pressure, low temperature, Saturated liquid
* Outlet is Low pressure, low temperature saturated liquid and vapour mixture

In evaporator (During process 4-1, Isobaric & Isothermal heat extraction):
* Inlet is low pressure; low temperature, Saturated liquid and vapour
* Outlet is low pressure; low temperature Saturated vapour

5 Years AKTU University Examination Questions		Unit-3	
S. No	Questions	Session	Lecture No
1	Define refrigeration and it applications in different fields.		16-23
2	What are the different methods of refrigeration?		16-23
3	What is refrigerant? Discuss the classification of refrigerant.		16-23
4	Write the short notes on ozone depletion and global warming.		16-23
5	Give the name of any four environment friendly refrigerants.		16-23
6	Explain the term 1 tonne of refrigeration.		16-23
7	Define refrigerator and heat pump.		16-23
8	What is the difference between a refrigerator and a heat pump?		16-23
9	Define the coefficient of performance of a refrigerator in words. Can it be greater than unity?	2020-21	16-23
10	Define the coefficient of performance of a heat pump in words. Can it be greater than unity?		16-23
11	Derive the relation between the COP of refrigerator and heat pump.		16-23
12	State elements of refrigeration systems.		16-23
13	Draw the neat diagram of a domestic refrigerator, showing its various parts. Explain its working also.	2020-21	16-23
14	The food compartment of a refrigerator is maintained at 4°C by removing heat from it at a rate of 360 kJ/min. If the required power input to the refrigerator is 2 kW, determine (a) the COP of the refrigerator and (b) the rate of heat rejection to the room		16-23
15	A heat pump has a COP of 1.7. Determine the heat transferred to and from this heat pump when 50 kJ of work is supplied.		16-23
16	A domestic food freezer maintains a temperature of – 15°C. The ambient air temperature is 30°C. If heat leaks into the freezer at the continuous rate of 1.75 kJ/s what is the least power necessary to pump this heat out continuously?		16-23
17	Find the co-efficient of performance and heat transfer rate in the condenser of a refrigerator in kJ/h which has a refrigeration capacity of 12000 kJ/h when power input is 0.75 kW.		16-23
18	A fish freezing plant requires 40 tons of refrigeration. The freezing temperature is – 35 °C while the ambient temperature is 30°C. If the performance of the plant is 20 % of the theoretical cycle working within the same temperature limits, calculate the power required.		16-23
19	Define the term 'air-conditioning'.		16-23
20	Enumerate the main parts of the equipment in the air-conditioning cycle.		16-23
21	What are the different applications of air- conditioning?		16-23
22	Define the following		16-23

	(i) Atmospheric air (ii) Dry Air (iii) Wet air		
23	Define the following (i) Saturated air (ii) specific humidity (iii) relative humidity		16-23
24	Define the following (i) Dry Bulb Temperature (ii) Wet Bulb Temperature (iii) Dew point Temperature		16-23
25	With the help of neat sketch describe the working of window type air-conditioner.	2020-21	16-23
26	Explain the factor which affects human comfort. What are the conditions for comfort air conditioning?		16-23

B.Tech First Year: Regular Course Lecture Plan Session 2022-23

Subject Name	Soft Skills

No.	Unit Name	Syllabus Topics	Lecture No
t-1	Applied Grammar and Usage	Transformation of Sentences: Simple, Compound and Complex	1
		Subject-Verb Agreement	2
		Prefix and Suffix, Advanced Vocabulary: Antonyms & Synonyms	3
		Homophones, Homonyms, New Word Formation, Select Word Power	4
nit-2	Listening and Speaking Skills	Active Listening: Meaning and Art of Listening, Traits of a Good Listener	5
		Listening Modes, Listening and Note Taking	6
		Types of Listening	7
		Listening Techniques using Ted Talk Audio Listening with Script Reading	8
		Pronunciation and Speaking Style	9
		Content and Sequencing	10
Init-3	Reading and Writing Skills	Reading Style : Skimming, Scanning,Churning & Assimilation	11
		Effective Writing Tools and Methods: Inductive Deductive, Exposition,	12
		Effective Writing Tools and Methods: Linear, Interrupted, Spatial & Chronological	13
		Official & Business Letter Writing (Claim letter)	14
		Official & Business Letter Writing (Sales letter)	15
		Agenda	16
		Notices and Minutes of Meeting	17
Unit-4	Presentation and Interaction Skills	Introduction to Oral Communication	18
		Nuances of Speech Delivery	19
		Modes of Speech Delivery	20
		Public Speaking: Confidence, Clarity and Fluency	21
		Individual Speaking:Elemtents	22
		Non-verbal Communication: Kinesics	23
		Paralinguistic features of Voice Dynamics, Proxemics, Chronemics	24
		Presentation Strategies: Planning , Preparation	25
		Presentation Strategies: Organization, Delivery	26

B.Tech First Year: Regular Course Lecture Plan Session 2022-23

Subject Name	Soft Skills

Unit No.	Unit Name	Syllabus Topics	Lecture No
Unit-5	Work-place skills	Leadership Qualities; Impact	27
		Communication skills for Leaders: Listening and Responding	28
		Mental Health at work place: Managing Stress, Techniques	29
		Application of 4 A's; Avoid; Alter; Access; Adapt	30

Signature	
Name of Subject Head	Ms. Monika Duggal