QUESTION BANK (UNIT WISE)

UNIT -1

1. (a)What are the advantages of dense air refrigeration system over an open air refrigerating system? [K2]
(b) Even though the temperature is low at high altitudes, what is the necessity of cooling air in aero plane? [K3]
2. (a) Derive an expression for COP of air refrigeration system following Bell Coleman cycle.[K2]
(b) The atmospheric air at pressure 1 bar and temperature -5^0 C is drawn in the cylinder of the compressor of a Bell-Coleman refrigerating machine. It is compressed isotropically to a pressure of 5 bar. In the cooler, the compressed air is cooled to 15^0C, pressure remaining the same. It is then expanded to a pressure of 1 bar in an expansion cylinder, from where it is passed to the cold chamber. Find: (a)The work done per kg of air, and (b)C.O.P. of the plant. (c)For air assume law for expansion $PV^{1.2}$ = constant. Law for compression $PV^{1.4}$ = constant and specific heat of air at constant pressure = 1kj/kg.k. [K3]
3. (a) Describe Boot strap cycle of air refrigeration system, with schematic layout and show the cycle on T-s diagram [K2]
(b) Describe Boot strap air evaporative cycle of air refrigeration system, with schematic layout and show the cycle on T-s diagram. [K2]
4. An air craft refrigeration plant has to handle a cabin load of 30 tonnes. The atmospheric temperature is 17^0C. The atmospheric air is compressed to a pressure of 0.95 bar and temperature of 30^0C due to ram action. This air is then further compressed in a compressor to 4.75 bar, cooled in a heat exchanger to 67^0C, expanded in a turbine to 1 bar pressure and supplied to the cabin. The air leaves the cabin at a temperature of 27^0C. The isentropic efficiencies of both compressor andturbine are 0.9. Calculate the mass of air circulated per minute and the C O P forair, cp=1.004kJ/kg K and $\lambda = 1.4$. [K3]
5. (a) Explain with neat sketch, working principle of reduced ambient air cooling system. Draw T-s diagram for the system. [K2]
(b) Describe with a sketch, working of regenerative cooling system. [K2]
6. (a) Explain the working of simple air cycle cooling system used for air crafts.[K2]
(b) Describe working of simple air evaporative cycle cooling system used for air crafts [K2]

UNIT 2

1. (a) With a neat sketch, explain the working principle of vapour compression refrigeration system. [K2]
(b) Analyze the effect of following parameters on VCR cycle. [K4]
(i) Wet Vapour after compression, (ii) Super HeatedVapour After compression
(iii)Sub cooled liquid refrigerant before expansion.

2. (a)What are the desirable properties of an ideal refrigerant? [K2]
(b) 28 Tonnes of ice from and at 0^oC is produced per day in an ammonia refrigerator. The temperature range in the compressor is from 25^0C to -15^0C. The vapour is dry and saturated at the end of compression and an expansion valve is used. There is no liquid sub cooling. Assuming actual COP of 62 % of theoretical, calculate the power required to drive the compressor. Following properties of ammonia are given: [K3]

Temperature (^{o}C)	Enthalpy (KJ/Kg)		Entropy (KJ/Kg K)	
	Liquid	Vapour	Liquid	Vapour
25	298.9	1465.84	1.1242	5.0391
-10	112.34	1426.54	0.4572	5.5490

3. (a) Analyze the Effect of suction pressure and discharge pressure on VCR cycle. [K4]
(b) A vapour compression refrigerator works between the pressure limits of 60 bar and 25 bar. The working fluid is just dry at the end of the compression and there is no under cooling of the liquid before the expansion valve. Determine: i. C O P of the cycle and ii. Capacity of the refrigerator if the fluid flow is at the rate of 5 kg/min. [K3]

Pressure (bar)	Saturation temp (K)	Enthalpy (kj/kg)		Entropy(kj/kg k)	
		Liquid	Vapour	Liquid	Vapour
60	295	151.96	293.29	0.554	1.0332
25	261	56.32	322.38	0.266	1.2464

4. (a) Explain the simple saturation cycle with flash chamber [K2]
(b) Explain the Simple saturation cycle with accumulator. [K2]
5. . (a) Describe the simple saturation cycle with subcooling of liquid refrigerant by vapor refrigerant. [K2]
(b) Describe the simple saturation cycle with sub cooling of liquid refrigerant by liquid refrigerant. [K2]
6. (a) Analyze the Actual VCR with theoretical cycle using T-s diagram. [k4]
(b) The temperature limits of an ammonia refrigerating system are 250C and 100C. If the gas is dry at the end of compression, calculate co-efficient of performance of the cycle assuming no under cooling of the liquid ammonia. Use the following data for the properties of ammonia: [K3]

Temperature (^oC)	Liquid Heat (KJ/Kg)	Latent Heat (KJ/Kg)	Liquid entropy (KJ/Kg K)
25	298.9	1166.94	1.1242
-10	135.37	1297.68	0.5443

UNIT-III
4. (a) Difference between air cooled and water cooled condensers?
(b) Derive an expression for the volumetric efficiency of reciprocation compressor.
5. A single stage single acting reciprocating compressor has a bore of 200mm and a stroke of 300mm. It receives vapour refrigerant at 1bar and delivers it at 5.5 bar. If the compression and expansion follows the law pv1.3=Constant and the clearance volume is 5 percentage of the stroke volume, determine (i) The power required to drive the compressor, if it runs at 500rpm (ii) The volumetric efficiency of the compressor..
6. (a) Give the various types of refrigerant compressors which are commonly used.
(b) Explain the constructional details of reciprocating type of compressor with the help of sketch.
7. What is the function of Evaporator and what are the different types of Evaporators? Explain any two with neat sketches.
8. Write the function of Expansion device and its classification? Explain any two with neat sketches.
9. (a) What are the different types of condensers used in a vapour compression refrigeration system?
(b) Explain the working principle of evaporative condenser with the help of neat labeled sketch.

UNIT-IV

1. Draw a neat line diagram of Electrrolux refrigerator and explain its working principle. What is the important role of hydrogen in this refrigeration system?
2. (a) Draw a neat diagram of lithium bromide water absorption system and explain its working.
(b) In a vapour absorption refrigeration system heating, cooling and refrigeration takes place at the temperature at 100^0C, 20^0C and -5^0C respectively. Find the max COP of the system.

3. Draw a neat sketch of a practical vapour absorption refrigeration cycle. Indicate there on the phases of various fields and the name of the equipments. Also indicate the direction of the external energy flow to or from the equipments.

4. Explain various efficiencies used in steam jet refrigeration system and Derive an expression for finding out the mass of motive steam required for kg of water vapour produced.

5. (a) Explain the Simple Vapour Absorption System with neat sketch.

(b) Write the desirable properties of an ideal Refrigerant and Absorbent Combination.

6. What is the principle of steam jet refrigeration system, Explain with the help of neat sketch the working of steam jet refrigeration system and analysis of steam jet refrigeration of system?

UNIT-V

1. Illustrate various psychrometric processes with neat sketches show all processes on Psychrometric chart ?[10]

2. (a) Define the term "Effective Temperature" and explain its importance in air-conditioning system. Describe the factors which affect effective temperature.[05]

(b) Explain the mechanism of human body which controls the body temperature as per atmospheric conditions.[05]

3. Explain RSHF, GSHF and ESHF with the help of psychrometric chart.[10]

4. (a)In a cooling application, moist air enters a refrigeration coil at the rate of 100 kg of dry air per minute at 35^0C and 50% RH. The apparatus dew point of coil is 5^0C and bypass factor is 0.15. Determine the outlet state of moist air and cooling capacity of coil in TR.[5]

(b) A room has a sensible heat gain of 24 KW and a latent heat gain of 5.2 KW and it has to be maintained at 26^0C DBT and 50% RH. 180 m^3/ min of air is delivered to the room determine the state of supply air. [5]

5. Define the "human comfort" and explain the factors which affect human comfort with comfort chart and zone of comfort for year-round air-conditioning.[10]

6. Following data refers to an air conditioning system to be designed for an industrial process for hot and wet climate.

Outside Conditions = 30^0 C DBT and 75% RH

Required Inside conditions= 20^0C DBT and 60%RH.

The required condition is to be achieved first by cooling and dehumidifying and then by heating. If $20m^3$ of air is absorbed by the plant every minute, find 1. Capacity of cooling coil in TR, 2. Capacity of cooling coil in KW, 3. Amount of water removed per hour and 4. By-Pass factor of the heating coil, if its surface temperature is 35^0C.

UNIT 6

1.(a) Classify the methods of humidification and explain about any two humidifiers with neat sketch.

(b) Classify the methods of Dehumidification and explain about any two Dehumidifiers with neat sketch.

2. (a) Explain the function of fans and classify them and explain each with suitable diagrams.

(b) Explain the function of Grills and registers.

3. State the methods of cleaning of air, classify the Air Filters explain them with neat diagrams.

4 .Explain about Summer, winter and Year round air conditioning with neat sketches.

5 Explain central, district and Unitary air-conditioning systems.

6 What are the different heat pump circuits? Explain (i) air to air design and (ii) air to water design with the help of neat sketch.