QUESTION BANK Semester – 5th

Subject – RAC Branch – mechanical

Short Question

1. Define ton of refrigeration.
2. Define relative C.O.P.
3. Write down all processes of Bell coleman cycle.
4. Write down C.O.P of joule cycle.
5. Draw the schematic diagram of vapor absorption cycle.
6. What is the difference between Refrigeration & Air conditioning?
7. What is purpose of condenser in vapour compression system?
8. Represent ideal vapour compression refrigeration system on T-S and p-h diagrams.
9. Explain the effect of sub-cooling in vapour compression refrigeration system.
10. With the help of psychrometric chart explain the sensible heating.
11. Which component of the simple vapour-absorption system replaces the compressor of a vapour-compression system.
12. What is the function of refrigerant?
13. Differentiate between open & closed air refrigeration system.
14. Draw schematic diagram of Bell-coleman cycle.
15. Write the function of rectifier in VARS.
16. Why condenser is used in refrigeration cycle?

(17) Write function of expansion valves with two examples.

(18) What is the chemical formula of refrigerant dichloro-difluoromethane?

(19) Define relative humidity.

(20) Write conditions of comfort air conditioning.

Long Question

(1) A refrigeration plant works between temperature limits of -5°c. The working fluid ammonia has a dryness fraction of 0.62 at entry to compressor. If the machine has a relative efficiency of 55%, calculate the amount of ice formed during a period of 24 hours. The ice is to be formed at 0°c from water at 15°c and 6.4kg of ammonia is circulated per minute. Specific heat of water is 4.187 kj/kg and latent heat of ice is 335kj/kg k. Properties of ammonia.

Temp.	Liquid heat	Latent heat	Entropy of liquid
25	298.9kj/kg	1167.1kj/kg	1.124kj/kg k
-7	158.2kj/kg	1280.8kj/kg	0.63kj/kg k

(2) One kg of air at pressure of 1.05 bar and a temperature of 20°c is compressed to 6 bar. It is then cooled to 27°c in the cooler before entering the expansion cylinder. Assuming compression and expansion as isentropic process, determine:

(iii) Refrigerating effect per kg of air

(iv) Theoretical C.O.P

Take $c_p = 1 kj/kg\ k$ and $\gamma = 1.4$

(3) A Bell-coleman refrigerator operates between pressure limits of 1 bar and 8 bar. Air is drawn from the cold chamber at 0°C, compressed and then it is cooled to 290°C before entering the expansion cylinder. Expansion and compression follows the law $PV^{1.35} = constant$. Calculate the theoretical COP of the system. For air take $\gamma = 1.4$, $c_p = 1.003$ kJ/kg.K.

(4) In a vapour compression refrigerator, the working fluid is superheated at the end of compression and is under cooled in the condenser before throttling. Sketch a working cycle on temperature entropy diagram and show how theoretical co efficient of performance may be calculated from this diagram.

(5) Explain the different method of improving the cop of simple compression refrigeration cycle.

(6) With a neat sketch explain the working of Bell-Coleman cycle and derive the expression for its cop.

(7) A refrigerating plant using CO_2 as refrigerant works between 25°C and -5°C. The dryness fraction of CO_2 is 0.6 at the entry of the compressor. Find the ice formed per day if the ice is formed at 0°C and from the water at 10°C. Quantity of CO_2 circulated = 10kg/min. Take relative efficiency = 0.6, Take cp (water) = 4.2 kJ/kg, latent heat of ice = 335 kJ/kg.

Temperature °C	Liquid heat (kJ/kg)	Latent heat (kJ/kg)	Entropy of liquid (kJ/kg K)
25	81.25	121.6	0.2513
-5	-7.53	245.8	-0.0419

(8) Compare between VCRS and VARS.

(9) Explain working of single acting reciprocating air compressor with suitable diagram.

(10) What should be the desirable properties of an ideal refrigerant?

(11) Describe winter Air conditioning system.

(12) Explain Shell and tube type evaporator.

(13) Write about the factors affecting comfort air conditioning.

(14) In a refrigeration system working on Joule cycle, air is compressed to 5 bar from 1 bar. Its initial temperature is 10°C. After compression, air is cooled upto 20°C in a cooler before expanding back to the pressure of 1 bar. Find COP of the system. Take C_p & C_v value for air as 1.005 KJ/kg-K & 0.718 KJ/kg-K respectively.

(15) Explain simple vapour Absorption Refrigeration system with neat sketch.

(16) A VCRS uses refrigerant R-40 and operates between temperature limits of -10°C & 45°C. At entry to the compressor, refrigerant is dry saturated & after compression it acquires a temperature of 60°C. Find COP of the refrigerating system. The properties of R-40 are.

Temp in °C	h_f (KJ/kg)	h_g (KJ/kg)	S_f (KJ/kg-K)	S_g (KJ/kg-K)
-10	45.4	460.7	0.183	1.637
45	133	483.6	0.485	1.587

(17) The atmospheric air at 25°C DBT and 12°C WBT is flowing at the rate of 100 m^3/min through the duct. The dry saturated steam at 100°C is injected into the air stream at the rate of 72 kg/Hour. Calculate specific humidity and enthalpy of the leaving air. Also determine DBT, WBT & relative humidity of leaving air.

(18) Write short notes on
(a) Automatic expansion valve
(b) cold storage plant.

(19) What is psychometric chart? Write its uses. Explain different types of psychometric processes.