GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2018

Subject Code:2161908   **Date:15/12/2018**

Subject Name:Refrigeration and Air Conditioning

Time: 02:30 PM TO 05:00 PM   **Total Marks: 70**

Instructions:
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

			MARKS
Q.1	**(a)**	What are the limitations of Carnot cycle for air refrigeration?	**03**
	(b)	Define: Refrigeration, Dry Bulb Temperature, COP, Saturated air.	**04**
	(c)	Explain Electrolux refrigerator with line diagram.	**07**
Q.2	**(a)**	Explain use of hygrometer and sling psychrometer.	**03**

Q.2 (b) In a Bell-Coleman refrigeration plant, the air is drawn from cold chamber at 1 bar and 15^θ C and compressed to 6 bar. Then air is cooled to 28^θ C in the cooler before expanding in the expander to the cold chamber pressure of 1 bar. The compression and expansion processes are isentropic. Calculate: 1) COP of the plant, 2) Refrigerating effect per kg of air.
Assume for air $\gamma = 1.4$ and $C_p = 1.005$ kJ/kgK   **04**

(c) An ammonia vapour compression refrigeration system produces 10 ton of ice from and at 0^θ C in a day. The system is operating between pressure limits of 2.9 bar and 12.3 bar. The ammonia vapour is dry and saturated at the end of compression. Calculate : (1) Mass flow rate of refrigerant and (2) Power required to drive the compressor.
Assume $(COP)_{act} = 60$ % of $(COP)_{ideal.}$
For ice $L = 330$ kJ/kg, for water $C_p = 4.187$ kJ/kgK
Use following properties for Ammonia   **07**

Pressure (bar)	Saturation Temp (^{o}C)	Specific enthalpy (kJ/kg)		Specific Entropy (kJ/kg K)	
		Liquid	Vapour	Liquid	Vapour
2.9	-10	154.01	1450.7	0.8293	5.7569
12.3	+32	351.45	1487.11	1.5196	5.2412

OR

(c) An aircraft simple air refrigeration system having a load of 10 TR. The atmospheric pressure and temperature are 0.92 bar and 15 $^\theta$C respectively. The pressure after ramming process is 1.015 bar. The air is cooled by 52 $^\theta$C in the heat exchanger. The cabin pressure is 1 bar and temperature of air leaving the cabin is 24 $^\theta$C. Calculate i) mass of air circulated per minute, ii) Power required to take the load of cooling in the cabin, iii) COP of the system.
Assume compression and expansion processes are isentropic and pressure ratio in main compressor is 4.   **07**

1

Q.3	(a)	List out factors affecting human thermal comfort and explain any one.	03
	(b)	State and explain various heat loads to be considered for cooling load calculation of typical building.	04
	(c)	50 m^3 of air per minute at 30$^\theta$ C DBT and 20$^\theta$ C WBT is passed over the cooling coil whose surface temperature is 5$^\theta$ C. The cooling coil capacity is 3.5 tones of refrigeration under the given condition of air. Determine DBT and WBT of air leaving the cooling coil, the bypass factor and water condensed at coil.	07

OR

Q.3	(a)	How are refrigerants classified?	03
	(b)	Represent following processes on psychrometric chart 1) Sensible cooling, 2) Dehumidification, 3) Heating with humidification, 4) Chemical dehumidification	04
	(c)	Explain vapour compression refrigeration cycle with superheated refrigerant before compression with p-h and T-s diagram.	07
Q.4	(a)	How will you assign number to the refrigerants: Dichloro difluoro methane and dichloro tetra fluoro ethane ?	03
	(b)	Discuss application of refrigeration in food industries.	04
	(c)	Explain practical vapour absorption refrigeration system with schematic diagram.	07

OR

Q.4	(a)	Advantages of vapour compression system over air refrigeration system.	03
	(b)	Explain working of cascad refrigeration system.	04
	(c)	Explain in brief the following: i) Filters, ii) Humidifiers used in air conditioning systems.	07
Q.5	(a)	Explain velocity reduction method with advantages and disadvantages.	03
	(b)	Explain with neat sketch working of hermetically sealed compressor.	04
	(c)	Explain all water central air conditioning system with diagram.	07

OR

Q.5	(a)	Write short note on split air conditioner.	03
	(b)	Explain working of flooded type evaporator with neat sketch.	04
	(c)	Explain difference between all air system and all water system? What are the advantages of all water system compared to all air system?	07

****