M.Tech. Heat Power Engineering (C.B.C.S. and C.B.S. Pattern) Sem-II

PHPS22 - Advanced Refrigeration and Air Conditioning

P. Pages : 2 **GUG/S/19/11007**

Time : Three Hours * 2 9 7 0 * Max. Marks : 70

Notes :
1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.
6. Answer **any five** questions.

1. a) Distinguish between VCRS & VARS System along with P – h & T – s diagram (atleast 8 points). **6**

b) Mention merits & demerits of vapour compression refrigeration system over air refrigeration system. **3**

c) Discuss in brief analysis of multi evaporator refrigeration system. **5**

2. a) A R – 12 refrigerating machine working on vapour comp. cycle receives saturated vapour at 5ºC at the entry to compressor. It is compressed isentropically refrigerant condensed at 40ºC. Determine **7**
i) COP
ii) Power per ton of refrigeration.
iii) Theoretical piston displacement per ton of refrigeration.
Using following properties at refrigerant.
Enthalpy of ref. at compressor Inlet = 189.7 kJ/kg
Sp. volume of ref. at compressor Inlet = 0.049 m^3/kg
Enthalpy of refrigerant at comp^r exit = 203.2 kJ/kg
Enthalpy of refrigerant at condenser exit = 74.6 kJ/kg
Represent the cycle on P – h & T – s chart.

b) Difference between primary & secondary refrigerants. Also mention the examples of primary refrigerants. **7**

3. a) Discuss in brief "Retrofitting of domestic refrigerator using hydrocarbon blends". **7**

b) Discuss the properties & uses of the following refrigerants. **7**
i) Ammonia
ii) R -12
iii) SO_2
iv) R – 134 a
v) R – 11

4. a) Derive an expression for COP of thermoelectric refrigeration System for the condition **7**
i) For maximum COP. ii) For minimum refrigeration effect.

b) Write short notes on 'Adsorption refrigeration systems'. Mention its applications. **7**

5. a) Explain with the help of neat sketch 'Linde's System' for liquefaction of air? Also mention its merits & demerits. **7**

b) Give the limitations of vapour compression refrigeration systems for production of low temperature. **4**

c) What is Cryogenic insulation? What are the different materials used for cryogenic insulations. **3**

6. a) What are the basic elements of air conditioning System. Explain in brief. **5**

b) Explain with the help of neat sketch 'Central air conditioning System' along with its merits & demerits. **5**

c) Write short notes on 'Air leakage & Duct maintenance' in air conditioning System. **4**

7. a) Explain the utility of following simulation softwares in refrigeration. **6**
i) Evap – Cond ii) PUREZ

b) Write short notes on following 'Load Estimation'. **8**
i) Cooling load estimate. ii) Heating load estimate

8. a) Explain with the help of neat sketch following filters used in air conditioning System. **6**
i) Dry air filters
ii) Viscous impingement filters.
iii) Electrostatic filters.

b) Write short notes on **any two**. **8**

i) Dual duct System in air – conditioning

ii) Air distribution Systems.

iii) Claude System for liquefaction of air

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