

M. Tech. Heat Power Engineering (CBCS Pattern) Semester-II
PHPS22 - Advanced Refrigeration and Air Conditioning

P. Pages : 2

Time : Three Hours



GUG/W/24/11007

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) Explain with the help of neat sketch, Analysis of multievaporator refrigeration system. **5**
b) Discuss in brief various pressure losses in actual VCRS system. Mention it on p-h & T-S chart. **4**
c) Discuss in brief lithium bromide adsorption ref. system along with its application, advantages & demerits. **5**
2. a) A refrigeration system of 10.5 tonnes capacity at an evaporator temperature of -12°C & condenser temperature of 27°C is needed in a food storage locker. The refrigerant ammonia is subcooled by 6°C before entering the expansion valve. The vapour is 0.95 dry as it leaves the evaporator coil. The compression in the compressor is isentropic. **6**
Find:
i) condition of vapour at outlet of compressor
ii) condition of vapour at entrance to evaporator
iii) COP
iv) Power in kW. Neglect valve throttling.
b) Difference between primary & secondary refrigerant. Also mention the examples of primary refrigerants. **4**
c) What are CFC & HFC refrigerants? Explain in detail. Also mention the examples of secondary refrigerants. **4**
3. a) Explain with the help of neat sketch 'Global Warming'? Explain its effects on human health? **5**
b) Explain in detail 'Montreal' & 'Kyoto-protocol'? **4**
c) What is the meaning of depletion of ozone layer? What are the effect of depletion of ozone layer? How can we prevent ozone layer depletion. **5**
4. a) Derive an expression for COP of thermoelectric refrigeration system for the condition- **6**
i) For maximum COP.
ii) For minimum Refrigeration effect.

- b) Explain in brief the following efficiencies of steam jet refrigeration system- 4
 i) Entrainment efficiency
 ii) Compression efficiency
 iii) Nozzle efficiency
- c) Discuss in brief “Retrofittings” of domestic refrigerator using hydrocarbon blends” 4
5. a) What is Cryogenic insulation? What are the different materials used for Cryogenic insulation. 4
- b) Explain with the help of neat sketch “Linde’s system” for liquefaction of air? Also mention its merits & demerits. 5
- c) How Cryogen’s are handled & stored? Also explain cryogenic insulation necessary. 5
6. a) State the principles of ‘air distribution system’. 4
- b) Write short notes on ‘Air leakage & duct maintenance in air conditioning system. 5
- c) Explain the following air distribution systems- 5
 i) ejector system
 ii) upward system
 iii) Downward system
7. a) Explain in brief following duct design methods. 5
 i) Velocity reduction
 ii) Equal friction
 iii) Static region
- b) Explain various pressure losses & dynamic losses in ducts? 4
- c) Discuss in detail simulation software in refrigerator system. 5
8. Write short notes on **any four**. 14
- i) Load estimation in air conditioning.
- ii) Window air conditioning system.
- iii) Classification of ducts & its material.
- iv) Different methods of air conditioning duct design.
- v) Marine air conditioning system.
- vi) Defrosting in Refrigerators.
