



**SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR**

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**QUESTION BANK (DESCRIPTIVE)**

**Subject/ Code :** (18ME3116) Refrigeration and Cryogenics **Regulation:** R18

**Course & Branch:** M.Tech - TE

**Year & Sem:** I-M.Tech & II-Sem

**UNIT-I**

- 1 Explain in detail the working principles of various methods to produce low temperatures 12M
- 2 Explain working principle of vapor compression refrigeration system with neat sketches and derive an expression for COP. 12M
- 3 What are the different types of Vapour Compression Refrigeration Cycle?  
Explain in detail with pv and ts chart about any one of it. 12M
- 4 Discuss multi-stage vapour compression refrigeration systems with flash gas removal and intercooling 12M
- 5 a Discuss the use of flash tank for flash gas removal only 12M  
b Discuss the use of flash tank for intercooling only
- 6 Describe multi-evaporator systems using single compressor and a pressure reducing valve with:  
a) Individual expansion valves 12M  
b) Multiple expansion valves
- 7 Describe briefly the cascade systems and working principle of auto-cascade cycle 12M
- 8 Discuss the advantages and applications of multi-evaporator systems compared to single stage systems 12M
- 9 What is mean dry ice? How it is manufactured? List the application of dry ice. 12M
- 10 What are the factors affecting the performance of vapour compression refrigeration system explain in detail. 12M

**UNIT II**

- 1 Discuss the performance aspects of ideal reciprocating compressors with clearance, specifically:  
a) Effect of evaporator temperature on system performance at a fixed condenser temperature 12M  
b) Effect of condenser temperature on system performance at a fixed evaporator temperature

- c) Effects of pressure ratio and type of refrigerant on compressor discharge temperature
- 2 Describe various methods of capacity control for reciprocating compressor 12M
- 3 Explain the working principle of a centrifugal compressor used in refrigeration system with neat sketch. 12M
- 4 Compare the performance of a centrifugal compressor with a reciprocating compressor in terms of condensing and evaporator temperatures and compressor speed 12M
- 5 Discuss the methods of capacity control of a centrifugal compressor 12M
- 6 Explain working principle and characteristics of a twin-screw type compressor 12M
- 7 Explain working principle and characteristics of a single-screw type compressor 12M
- 8 Explain working principle, characteristics and specific advantages of a scroll compressor 12M
- 9 Discuss methods of compressor lubrication 12M
- 10 Explain the performance aspects and the phenomenon of surging in centrifugal compressors 12M

### UNIT-III

- 1 Classify refrigerant condensers based on the external fluid used, based on constructional details 12M
- 2 Compare air cooled condensers with water cooled condensers 12M
- 3 a The average condensing heat transfer coefficient for a refrigerant condensing on a single horizontal tube is found to be  $4000 \text{ W/m}^2 \cdot \text{K}$ . Now another tube is added directly below the first tube. Assuming everything else to remain constant, what will be the new average condensing heat transfer coefficient? 12M
- b A refrigeration system of 55 kW cooling capacity that uses a water-cooled condenser has a COP of 5.0. The overall heat transfer coefficient of the condenser is  $450 \text{ W/m}^2 \cdot \text{K}$  and a heat transfer area of  $18 \text{ m}^2$ . If cooling water at a flow rate of  $3.2 \text{ kg/s}$  enters the condenser at a temperature of  $30^\circ \text{C}$ , what is the condensing temperature? Take the specific heat of water as  $4.18 \text{ kJ/kg} \cdot \text{K}$ .
- 4 Find the length of tubes in a two pass 12M TR Shell-and-Tube R-22 based, water-cooled condenser with 52 tubes arranged in 13 columns. The Heat Rejection Ratio (HRR) is 1.2747. The condensing temperature is  $45^\circ \text{C}$ . Water inlet and outlet temperature are  $30^\circ \text{C}$  and  $35^\circ \text{C}$  respectively. The tube outer and inner diameters are 14.0 and 16.0 mm respectively. 12M

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| 5  | Determine the required face area of an R 12 condenser for 5 TR refrigeration plant. The condensing temperature is 40°C, the system COP is 4.9 and refrigeration effect is 112M.8 kJ/kg. Air at an inlet temperature of 27°C flows through the condenser with a face velocity of 2.5 m/s. The inside and outside diameters of the tubes are 11.26 and 12.68 mm, respectively. Fin efficiency is 0.73. Other dimensions with reference are: B = 43 mm; C = 38 mm, D = 3.175 mm, t = 0.254 mm | 12M |
| 6  | Explain the working of evaporator with neat sketch about any one type.   | 12M |
| 7  | Classify refrigerants into primary and secondary, and discuss the important differences between primary and secondary refrigerants   | 12M |
| 8  | Discuss refrigerant selection criteria based on thermodynamic, thermophysical, environmental and economic properties   | 12M |
| 9  | Discuss in detail about various application of refrigeration system  | 12M |
| 10 | Discuss in detail about CFC & HCFC refrigerants.   | 12M |

#### UNIT-IV

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| 1  | What is need of low temperature insulation and list the methods of insulation systems.        | 12M |
| 2  | Explain in detail about gas filled powder insulation system and reflective insulation system. | 12M |
| 3  | Discuss about expanded foam insulation system with its merits and demerits                    | 12M |
| 4  | What are the different techniques of gas separation commonly used explain with neat sketch    | 12M |
| 5  | Define cryogenics. Explain any one common method of cryogenics with neat sketch               | 12M |
| 6  | Explain in detail about the concept of ideal separation system.                               | 12M |
| 7  | Discuss in detail about various application of gas separation system                          | 12M |
| 8  | What are the methods involved in air separation and storage in cryogenics system.             | 12M |
| 9  | Explain the working of adiabatic demagnetization refrigeration system with neat sketch.       | 12M |
| 10 | What are the hazards and their cause in cryogenic industries. Explain in detail               | 12M |

#### UNIT- V

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| 1 | List out Various liquefaction cycles. Discuss in detail about Linde system.  | 12M |
| 2 | How liquefaction of hydrogen gas is done explain in detail with neat sketch. | 12M |
| 3 | Explain the process involved in liquefaction of helium gas.                  | 12M |
| 4 | List the application of lower temperature systems.                           | 12M |

- 5 Discuss in detail about properties of various metals at low temperature 12M
- 6 Discuss about methods involved in handling of cryogenics liquids and also explain about super conductivity phenomenon in cryo liquids 12M
- 7 Explain the working principle of dual pressure cycle in gas liquefaction system 12M
- 8 What are the different techniques of gas separation commonly used explain with neat sketch 12M
- 9 Classify refrigerants into primary and secondary, and discuss the important differences between primary and secondary refrigerants 12M
- 10 Discuss the advantages and applications of multi-evaporator systems compared to single stage systems 12M