

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VI (New) EXAMINATION – WINTER 2019****Subject Code: 2161908****Date: 16/12/2019****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.
4. Use of refrigerant property table with p-h and T-s diagram and psychrometric chart is allowed.

- Q.1** (a) Explain VCR cycle with proper T-s and P-h diagrams. **03**
 (b) Explain Dalton's law of partial pressure. How evaporation happens in atmosphere? **04**
 (c) A Freon 12 VCR system operation at a condenser temperature of 50 °C and an evaporator temperature of -10 °C develops 25 tons of refrigeration. **07**
 Using p-h diagram for Freon 12, determine;
 (a) The mass flow rate of the refrigerant circulated. (b) the theoretical piston displacement of the compressor and piston displacement per ton of refrigeration (c) The theoretical horse power of the compressor and horse power per ton of refrigeration (d) the heat rejected in the condenser
- Q.2** (a) Mention limitations of Carnot cycle with gas as a refrigerant. **03**
 (b) Define following terms: **04**
 (1) Specific Humidity
 (2) Dew point temperature
 (3) Relative Humidity
 (4) Degree of saturation.
 (c) An open-air refrigeration system operating between pressure of 16 bar and 1 bar is required to produce 33.5 kW refrigeration. The temperature of air leaving the refrigerated room is -5 °C and that leaving the air cooler is 30 °C. Assume no losses and clearance. Calculate for the theoretical cycle: (i) weight rate of air circulated per minute (ii) Piston displacement of compressor and expander (iii) Net work (iv) COP. **07**
- OR**
- (c) Explain with neat sketch flash intercooling. What are the advantages of it? **07**
- Q.3** (a) Explain desired thermo-chemical and physical properties of a refrigerant for VCR cycle. **03**
 (b) Explain cascade refrigeration system. **04**
 (c) One cubic metre of H₂ at 1 bar and 25 °C is mixed with one cubic metre of O₂ at 1 bar and 25 °C. For mixture at the same conditions, Find: (i) Mole fraction of components (ii) partial pressure of components (iii) mass fraction of components (iv) molecular weight of the mixture (v) gas constant of the mixture (vi) volume of the mixture. **07**
- OR**
- Q.3** (a) What is effective temperature, explain its use in cooling process. **03**
 (b) Vapour absorption refrigeration system is not as efficient as VCR cycle, Justify. **04**
 (c) Explain construction and working of thermostatic expansion valve. **07**
- Q.4** (a) What do you understand by the term cooling load? **03**

- (b) Explain flywheel effect of building material and its use in design. **04**
(c) Draw a neat diagram of air-conditioning system required for winter season. Explain the working of different components in the circuit. **07**
- OR**
- Q.4** (a) Describe the different types of water coolers. **03**
(b) Compare windows air conditioning system with split air conditioning system. Mention advantages of each. **04**
(c) The humidity ratio of atmospheric air at 28 °C dry bulb temperature and 760 mm of mercury is 0.016 kg/kg of dry air. Determine: (1) partial pressure of water vapour (2) relative humidity (3) dew point temperature (4) specific enthalpy (5) vapour density. **07**
- Q.5** (a) Write a short note on methods of defrosting. **03**
(b) Write a short note on cooling tower. **04**
(c) Describe the different methods of air conditioning duct design. Why are dampers required in some systems? **07**
- OR**
- Q.5** (a) On what factors does the volumetric efficiency of a compressor depend? **03**
(b) Explain the effect of subcooling of condensate with the help of T-s and P-h diagram in VCR cycle. **04**
(c) Explain working of Li-Br vapour absorption refrigeration system with neat sketch. **07**

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