

**TE/Insem/APR-108****T.E. (Mechanical)****REFRIGERATION & AIR CONDITIONING****(2015 Pattern) (Semester - II)***Time : 1 Hour]**[Max. Marks : 30**Instructions to the candidates:*

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6.
- 2) Figures to the right side indicate full marks.

- Q1)** a) Explain with schematic refrigeration system for water cooler. [6]  
 b) Explain with example use of secondary refrigerants. [4]

**OR**

- Q2)** a) Explain with neat sketch working of evaporative cooler. [6]  
 b) Mention four names of inorganic refrigerants with refrigerant number.[4]

- Q3)** a) Explain the desirable properties of absorbent. [4]  
 b) A vapour compression refrigerator of capacity 5 TR, uses methyl chloride (R40) operates between temperature limits of  $-10^{\circ}\text{C}$  and  $45^{\circ}\text{C}$ . At entry to the compressor, the refrigerant is dry saturated and after compression it acquires a temperature of  $60^{\circ}\text{C}$ . There is no undercooling. Find i) COP of the refrigerator, ii) Power required to run the compressor. The relevant properties of methyl chloride are as follows: [6]

Take  $C_{p_v} = 1.09 \text{ kJ/kgK}$ 

| Sat. Temp          | $h_f$ | $h_g$ | $s_f$   | $s_g$   |
|--------------------|-------|-------|---------|---------|
| $^{\circ}\text{C}$ | kJ/kg | kJ/kg | kJ/kg.K | kJ/kg.K |
| -10                | 45.4  | 460.7 | 0.183   | 1.637   |
| 45                 | 133.0 | 483.6 | 0.485   | 1.587   |

OR

- Q4) a)** Explain the effect of decreasing evaporator pressure on performance of VCC. [4]
- b) A vapour absorption system, heating in generator, cooling in condenser and refrigeration in evaporator takes place at  $150^{\circ}\text{C}$ ,  $30^{\circ}\text{C}$  and  $-20^{\circ}\text{C}$  respectively. Find theoretical COP. If generator temperature is increased to  $190^{\circ}\text{C}$  and evaporator temperature is decreased to  $-30^{\circ}\text{C}$ . Condenser temperature is not changed. Find percent change in theoretical COP. [6]
- Q5)** A multi evaporator refrigeration system with individual compressors and an individual expansion valves use R-134a as a refrigerant. The refrigeration capacity is 5 TR of the high temperature evaporator operating at  $-10^{\circ}\text{C}$ , while it is 10TR for the low temperature evaporator operating at  $-20^{\circ}\text{C}$ . The condenser temperature is  $40^{\circ}\text{C}$ . Assume saturated conditions at the exit of both evaporators and there is no sub-cooling. Draw schematic of system. Draw P-h diagram of the system. Determine i) Mass flow rate of each evaporator ii) Total power iii) COP of system. [Use P-h Chart R-134a] [10]

OR

- Q6) a)** Explain with schematic and P-h diagram cascade refrigeration system. [6]
- b) What is cryogenics? Give any two applications of cryogenics. [4]





