

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°C and 45°C . At entry to the compressor, the refrigerant is dry saturated and after compression it acquires a temperature of 60°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°C , 30°C and -20°C respectively. Find theoretical COP. If generator temperature is increased to 190°C and evaporator temperature is decreased to -30°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°C , while it is 10TR for the low temperature evaporator operating at -20°C . The condenser temperature is 40°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]



