

5th Sem. /MECH/DIP IN MECH/MECH(PROD)/MECH(MAINT)/
MECH(IND INTG)/MECH(SWITCH)/ 2021(W)
Th5 Refrigeration & Air Conditioning

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. Define tonne of refrigeration.
 - b. What is the function of refrigerant?
 - c. Differentiate between open & closed air refrigeration system.
 - d. Draw schematic diagram of Bell-Coleman cycle.
 - e. Write the function of rectifier in VARS.
 - f. Why condenser is used in refrigeration cycle?
 - g. Write function of expansion valves with two examples.
 - h. What is the chemical formula of refrigerant dichloro-difluoro methane?
 - i. Define relative humidity.
 - j. Write conditions of comfort air conditioning.

2. Answer **Any Six** Questions 6 x 5
 - a. Compare between VCRS and VARS.
 - b. Explain working of single acting reciprocating air compressor with suitable diagram.
 - c. What should be the desirable properties of an ideal refrigerant?
 - d. Describe Winter Air Conditioning system.
 - e. Explain Shell and tube type evaporator.
 - f. Write about the factors affecting comfort air conditioning.
 - g. In a refrigeration system working on Joule cycle, air is compressed to 5bar from 7bar. Its initial temperature is 10°C . After compression, air is cooled upto 20°C in a cooler before expanding back to the pressure of 1 bar. Find COP of the system. Take C_p & C_v value for air as 1.005KJ/Kg-K & 0.718 KJ/Kg-K respectively.

- 3 Explain simple Vapour Absorption Refrigeration System with neat sketch. 10
- 4 A VCRS uses refrigerant R-40 and operates between temperature limits of -10°C & 45°C . At entry to the compressor, refrigerant is dry saturated & after compression it acquires a temperature of 60°C . Find COP of the refrigerating system. The properties of R-40 are 10

Temp in $^{\circ}\text{C}$	$h_f(\text{KJ/Kg})$	$h_g(\text{KJ/Kg})$	$S_f(\text{KJ/Kg-k})$	$S_g(\text{KJ/Kg-k})$
-10	45.4	460.7	0.183	1.637
45	133	483.6	0.485	1.587

- 5 The atmospheric air at 25°C DBT and 12°C WBT is flowing at the rate of $100\text{m}^3/\text{min}$ through the duct. The dry saturated steam at 100°C is injected into the air stream at the rate of 72 Kg/Hour. Calculate specific humidity and enthalpy of the leaving air. Also determine DBT, WBT & relative humidity of leaving air. 10
- 6 Write short notes on 10
- Automatic Expansion Valve
 - Cold storage plant
- 7 What is psychrometric chart? write its uses. Explain different types of psychrometric processes. 10