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Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(ME) (2011 Onwards) (Sem.-7,8)
REFRIGERATION AND AIR CONDITIONING
Subject Code : BTME-802
Paper ID : 71995

Time : 3 Hrs.

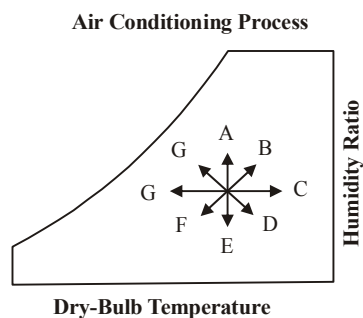
Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A**Q1. Write briefly :**

- a. Define C.O.P of refrigerator.
- b. Difference between heat engine/refrigerator and heat pump.
- c. Explain sub cooling, super heating with sketch.
- d. What are secondary refrigerants?
- e. Define :
 - i. Dry bulb
 - ii. Degree of saturation
- f. Define absolute humidity.
- g. Name the processes B, C, E, G from the figure 1 below.



- h. Which material is commonly used for making ducts in the air conditioning system and why?
- i. Write chemical formula and names of refrigerant R-114?
- j. Name four refrigerants?

SECTION-B

- Q2. Discuss in detail the desirable Physical properties of Refrigerant
- Q3. Explain regenerative Air Cooling System with the help of a neat sketch.
- Q4. A quantity of air having a volume of 300 m^3 at 30°C dry bulb temperature and 25°C wet bulb temperature is heated to 40°C dry bulb temperature. Estimate the amount of heat added, final relative humidity and wet bulb temperature. The air pressure is 1.01325 bar.
- Q5. A Carnot cycle machine operates between the temperatures limits of 47°C and -30°C . Determine C.O.P. when it operates as :
- a. a refrigerating machine
 - b. a heat pump and
 - c. a heat engine
- Q6. The humidity ratio of atmospheric air at 28°C dry bulb temperature and 760 mm of mercury is 0.0016kg/kg of dry air. Determine :
- a. partial pressure of water vapour
 - b. relative humidity
 - c. dew point temperature
 - d. specific enthalpy
 - e. vapour density

SECTION-C

- Q7. Explain in detail the Lithium Bromide absorption refrigeration system with the help of a neat sketch.
- Q8. An aircraft refrigeration plant has to handle a cabin load of 30 tonnes. The atmospheric temperature is 17°C . The atmospheric air is compressed to a pressure of 0.95 bar and temperature of 30°C due to ram action. This air is then further compressed in a compressor to 4.75 bar, cooled in a heat exchanger to 67°C , expanded in a turbine to 1 bar pressure and supplied to the cabin, the air leaves the cabin at a temperature of 27°C . The isentropic efficiencies of both compressor and turbine are 0.9. Calculate the mass of air circulated per minute and the C.O.P. for air, $C_p = 1.004 \text{ kJ/kg K}$ and $C_p/C_v = 1.4$.
- Q9. A vapour compression refrigerator works between the pressure limits of 60 bar and 25 bar. The working fluid is just dry at the end of compression and there is no under cooling of the liquid before the expansion valve. Determine :
- C.O.P. of the cycle;
 - Capacity of the refrigerator if the fluid flow is at the rate of 5 kg /min.

Data :

Pressure (bar)	Saturation temperature(K)	Enthalpy (kJ /kg)		Entropy (kJ/kg K)	
		Liquid	Vapour	Liquid	Vapour
60	295	151.96	293.29	0.554	1.0332
25	261	56.32	322.58	0.226	1.2464

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.