Q.P.Code: 39746

(3 Hours) **[Total Marks: 80]**

N.B.: (1) Question No. 1 is compulsory.

(2) Answer any three from the remaining five questions.

(3) Assumptions made if any should be justified.

(4) Use of Refrigerant Charts, Psychrometric Chart, Friction Chart and Steam Tables are allowed.

1. Answer any four of the following. [20]
   a) Draw simple vapour compression cycle on P-h diagram and explain the processes.
   b) What is subcooling and superheating ? Explain its effect on the performance of vapour compression cycle.
   c) If the COP of a 1 TR Air Conditioner is 3.5; how much power will the compressor consume ? Also calculate the amount of heat rejected in the condenser.
   d) List down types of aircraft refrigeration systems. Draw simple air cooling system with neat schematic and T-s diagram.
   e) What is human comfort ? Explain with help of ASHRAE Comfort chart..
   f) What are primary and secondary refrigerants? Give examples with application of each type.

2. a) A bootstrap air refrigeration system of 30 TR capacity is used for an aeroplane flying at an altitude of 2000 m. The ambient air pressure and temperature are 0.8 bar and 0 ^{0}C. The ram air pressure and temperature are 1.05 bar and 17 ^{0}C. The pressure of air after isentropic compression in the main compressor is 4 bar. This air is now cooled to 27 ^{0}C in another auxillary heat exchanger and then expanded isentropically upto the cabin pressure of 1.01 bar. If the air leaves the cabin at 25 ^{0}C and the efficiencies for the main compressor, auxillary compressor and the cooling turbine are 80 %, 75 % and 80 % respectively; find : i) Power required to operate the system and ii) COP of the system [12]
   b) Classify refrigeration compressors. Explain each type in brief. [08]

3. a) Define the terms DBT, WBT, DPT and RH. [04]
   b) What are the different types of Cooling Towers? Define Range and Approach. [06]
   c) Draw a neat diagram of Electrolux vapour absorption refrigeration system and explain its working. [10]

4. a) A vapour compression system using Ammonia works between -25 ^{0}C and 40 ^{0}C as evaporator and condenser temperature respectively. Using P-h Chart, determine [12]
   i) COP ii) Mass of refrigerant per TR
   iii) Piston displacement per TR using volumetric efficiency = 83 %
   iv) Heat rejected in the condenser per TR
   v) Ideal COP

TURN OVER

b). Draw a neat sketch of Year Round Air Conditioning system and explain working of its components. [08]

5. a) What are the sources of cooling load for a Restaurant ? Discuss in details. [06]

b) Define body temperature regulation and effects of extremes of hot and cold climate on human body. [06]

c) A sling psychrometer reads 40 ^{0}C DBT and 28 ^{0}C WBT when atmospheric pressure is 750 mm of Hg. [08]

Calculate using Steam Tables only i). Specific humidity ii). Relative humidity iii). Dew point temperature iv). Enthalpy

6. Write short notes on any four. [20]

a) Liquefaction of Gases
b) Duct Design Methods
c) Desirable Properties of Refrigerants
d) Thermoelectric Refrigeration
e) Star Rating of Air Conditioners
f) DART rating of Air Refrigeration Systems

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Subject: Correction in Program Code : T5328 - B.E.(MECHANICAL)(SEM VIII) (CBSGS)(REV.2012) / T1742 - Refrigeration & Air Conditioning\tQ.P code : 39746

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University of Mumbai

Correction in Program Code : T5328 - B.E.(MECHANICAL)(SEM VIII) (CBSGS)(REV.2012) / T1742 - **Refrigeration & Air Conditioning Q.P code : 39746**

Read As,

Q.2) a) .....in the main compressor is 4 bar. **The pressure of air after compression in the auxillary compressor is 5 bar**.....

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