Pages: 02 **Sub Code: KME072**

Paper Id: **Roll No.** | | | | | | | | | | | | |

B.TECH.(SEM VII)
MODEL PAPER 2022-23
HVAC SYSTEMS

Time: 3Hours ***Total Marks: 100***

Note: Attempt all Sections. If you require any missing data, then choose suitably.
Use of refrigeration table and steam table is permitted.

SECTIONA

1. Attempt *all* questions in brief. 2x10=20

(a) What is Effective Sensible Heat Factor?
(b) Define effective temperature. Explain its utility in comfort air conditioning.
(c) What is human comfort according to ASHRAE?
(d) Which type of duct is normally preferred in air conditioning?
(e) Define specific speed of a centrifugal fan.
(f) What is performance index of heat pump?
(g) Explain evaporative cooling.
(h) Suggest materials used in fabrication of duct.
(i) Explain the importance of alignment circle, in psychometric chart.
(j) Differentiate between natural and mechanical ventilation.

SECTIONB

2. Attempt any *three* of the following: 10x3=30

(a) What are the desirable properties of an ideal refrigerant?
(b) Analyze the factors that determine human comfort.
(c) Describe the different methods of air conditioning duct design.
(d) The moist air at 10^0C and 50% relative humidity enters at steam heating coils at the rate of 50kg/sec and the temperature at the exit is noted to be 30^0C.Determine
  i) Sensible heat transfer
  ii) Mass flow rate of steam if it enters saturated at 100^0C and the Condensate leaves at 65^0C.
(e) Differentiate among all water, all air and air water air conditioning system.

SECTIONC

3. Attempt any *one* part of the following: 10x1=10

(a) Derive the expression for COP of a refrigerating system consisting of three evaporators at the same temperature with single compressor and expansion valve.

(b) Explain the effects of superheating, subcooling and reduction in condenser presser in COP of the vapour compression refrigeration system.

4. Attempt any *one* part of the following: 10x1=10

(a) Explain the various industrial applications of air conditioning.

(b) Define human comfort. Explain the factors affecting human comfort.

5. Attempt any *one* part of the following: 10x1=10

(a) Compare all-water all-air and air-water air conditioning systems.

(b) Classify heat pump and explain any one type of it.

6. Attempt any *one* part of the following: 10x1=10

(a) A quantity of air having a volume of 300 m^3 at 30^0C D.B.T.and 25^0C W.B.T. is heated to 40^0C D.B.T. Estimate the amount of heat added, final R.H. and W.B.T.

(b) A seminar hall for seating 250 person is to be maintained at 22^0C DBT and 50% RH.The outside air conditions are 40^0C DBT and 27^0C WBT. the various loads on the auditorium are as follows:
Sensible and latent heat load per person 80W and 50W respectively.
Light and fans, 15000W
The air filtration is 30 m^3/min;
Determine room sensible heat factor.

7. Attempt any *one* part of the following: 10x1=10

(a) A stream of air at 20 0C, 90% relative humidity and flowing at the rate of 5 m3/min mixes adiabatically with another air with corresponding Parameters of 30 0C, 50% and 20 m3/min. Presuming that both the Streams are at 760 mm of mercury pressure, determine the following Parameters for the mixed stream:
(a) Dry and wet bulb temperature,
(b) Relative humidity and specific humidity.

(b) Compare the characteristic of backward and forward curved blade vanes with the help of suitable sketch.