

(03 Hours)

[Total

Marks:80

- N.B:** (1) Attempt **ANY FOUR** questions from **SIX** questions.
 (2) Assume suitable data,if necessary.
 (3) Steam tables,Psychrometric Charts/tables,Refrigerants Charts/tables are **Permitted**.

1. (a) Show that the COP of cascade system is 12

$$\text{COP} = \frac{(\text{COP})_{\text{LT}} \cdot (\text{COP})_{\text{HT}}}{1 + (\text{COP})_{\text{LT}} + (\text{COP})_{\text{HT}}}$$

Where Suffix "LT" belongs to low temperature cycle and "HT" belongs to high temperature cycle. Assume m_{r1} & m_{r2} are the refrigerant masses in LP and HP cycles .

- (b) Explain in brief **any two** of the following with neat sketch- 08
- i) Vortex tube refrigeration system.
 - ii) Fan similarity laws.
 - iii) Triple effect LiBr+ water vapour absorption system.

2. (a) Enumerate the various types expansion devices used in industrial and commercial refrigeration and air conditioning system and explain any one of them with neat sketch. 08

- (b) Write short note of the following - 12
- i) Thermostats-Types & explain any one with sketch.
 - ii) Piping arrangements used for hot water heating system.-Types & explain any one with sketch.

3. (a) Explain air distribution system used for any two following purposes with sketches-i) Dining room ii) Gymnasium and recreation club iii) Railroad cars 10

- (b) Enumerate the various types air conditioning systems used for aircraft. Discuss briefly, any one with neat sketch. 10

4. A retail shop located in a city at 30°N latitude has the following loads: 20

Room sensible heat= 58.15 kW

Room latent heat = 14.54 kW

The summer outside and inside design conditions are

Outside:40°C DBT, 27°C WBT

Inside : 25° C DBT, 50% RH

70 m³/min of ventilation air is used. Determine the following, if the by- pass factor of the cooling coil is 0.15:

- i) Ventilation load; ii) Grand total heat iii) ERSHF iv) ADP v)Dehumidified air quantity vi) Condition of air entering and leaving the apparatus.

5. (a) Enlist different types of air filters used in air conditioning system. Explain any one air filter with neat sketch. **10**
- (b) Explain air conditioning by Modified Evaporative Cooling when outside air is hot & dry with neat sketch and represent it on psychrometric chart. **10**
6. Write short notes on **ANY FOUR** of the following- **20**
- i) Duct design Methods.
 - ii) H.P and L.P cut- outs.
 - i) Humidistat-Types & explain any one with sketch.
 - iii) Cooling Towers.
 - iv) Heat pump circuits- Types & explain any one with sketch.
 - v) Pulse tube refrigeration
