

2122

B.E. (Mechanical Engineering)
Seventh Semester
MEC-701: Refrigeration and Air Conditioning

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 (Section-A) which is compulsory and selecting two questions each from Section B-C. Use of Refrigeration and Air Conditioning tables and charts is allowed.

x-x-x

Section - A

1. (i) For a refrigeration system undergoing irreversible cycle, value of $\oint \frac{\delta Q}{T}$ is _____
- (ii) Subcooling with regenerative heat exchanger is used in a refrigeration cycle. The enthalpies at condenser outlet and evaporator outlet are 78 and 182 kJ/kg respectively. The enthalpy at outlet of isentropic compressor is 230 kJ/kg and enthalpy of sub-cooled liquid is 68 kJ/kg. The COP of the cycle is _____.
- (iii) Round the clock cooling of an apartment having a load of 300 MJ/day requires an air-conditioning plant of capacity _____
- (iv) Write the advantages of cooling towers used in Refrigeration Industry.
- (v) Discuss the importance of ODP and GWP by giving examples of refrigerants.
- (vi) The process of replenishing the refrigeration system with refrigerant is known as _____
- (vii) Other name for bubble column is _____
- (viii) _____ is used to located maximum value of Vapour compression refrigeration system.
- (ix) Bypass factor is the ratio of _____
- (x) Carrier Equation is used to _____

(10x1)

Section - B

2. Explain in detail the working of Lithium bromide vapour absorption system. Compare air refrigeration and vapour compression refrigeration systems.
3. Explain the process of throttling for real gas in detail. A simple saturation ammonia compression system has a high pressure of $1.35MN/m^2$ and low pressure of $0.19MN/m^2$. Find per $400000kJ/h$ of refrigeration capacity, the power consumption of the compressor and COP of the cycle.
4. A Bell-Coleman cycle works between 1 and 6 bar pressure limits. The compression and expansion indices are 1.25 and 1.3, respectively. Obtain COP and tonnage of the unit for an air flow rate of $0.5kg/s$. Neglect clearance volume and take temperatures at the beginning of compression and expansion to be $7^\circ C$ and $37^\circ C$, respectively.

(2x10)

P.T.O.

(2)

Section - C

5. Explain in detail the working of three fluid system with neat diagram.
6. Discuss in detail various thermodynamic, chemical, physical properties of refrigerants in detail?
7. A retail shop located in the city at 30° N latitude has the following loads:

RSH gain = 60 kW

RLH gain = 15 kW

The summer outside and inside conditions are:

Outside: 40°C DBT and 27°C WBT

Inside: 25°C DBT and 50% RH

70 cmm of ventilation air is used. Determine the following if the bypass factor of the cooling coil is 0.15:

- (i) Ventilation load
- (ii) Grand Total Heat.
- (iii) Effective room sensible heat factor.
- (iv) Apparatus dew point.
- (v) Dehumidified air quantity.
- (vi) Condition of air entering and leaving the apparatus.

(2x10)

x-x-x