22660

24225

3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

(7) Use of steam tables, logarithmic, Mollier's chart is permitted.

(8) Use of psychrometric chart is permitted.

Marks

1. Attempt any FIVE : **10**

(a) Represent Bell Coleman cycle on p-v & T-s diagram.

(b) Give classification of refrigerants.

(c) State the function of solenoid valve.

(d) State Dalton's law of partial pressure.

(e) Name any two types of Dehumidifiers.

(f) Define the term effective temperature.

(g) List any four desirable properties of insulating materials used in air conditioning applications.

2. Attempt any THREE : **12**

(a) Draw a neat labelled sketch of simple aircraft cooling system. Represent it on T-S diagram.

(b) Explain the term Greenhouse effect and global warming.

(c) Explain with neat sketch working of Thermostatic expansion valve.

(d) Represent the following psychrometric processes on psychrometric chart :

(i) Adiabatic humidification

(ii) Latent cooling

(iii) Sensible cooling

(iv) Sensible heating

3. Attempt any THREE : **12**

(a) An inventor has claimed to have manufactured a refrigerator having CoP 7.4 when working between –10 °C and 30 °C. Check whether his claim is correct or not.

(b) A refrigerator using Carnot cycle require 1.25 kW per tonne of refrigeration to maintain a temperature of –30 °C. Find

(i) CoP of Carnot refrigerator

(ii) Temperature at which heat is rejected

Also draw p-v & T-S diagram of Carnot cycle.

(c) Explain the working of simple VCR cycle with block diagram.

(d) What are the sources which contribute to the sensible heat gain ?

4. Attempt any THREE : **12**

(a) Compare open type and hermetically sealed compressor (any four points).

(b) In winter air-conditioning system, 100 m^3 of air per minute at 15 °C DBT and 80% RH is heated until its DBT is 22 °C with constant specific humidity. Find heat added to air per minute by using psychrometric chart.

(c) Draw a neat sketch of closed perimeter duct system. Where it is preferred ?

(d) Draw a neat sketch of window air conditioner and explain its working.

(e) Explain with neat sketch the construction of slings psychrometer.

5. Attempt any TWO : **12**

(a) The temperature limits of an ammonia refrigerating system are 25 and –10 °C. If the gas is dry at the end of compression, calculate the CoP of the cycle assuming no undercooling of the liquid ammonia. Use following table for properties of ammonia :

Temp °C	**Liquid heat h_f (kJ/kg)**	**Latent heat h_{fg} (kJ/kg)**	**Liquid entropy S_f (kJ/kg k)**
25	298.9	1166.94	1.1242
–10	135.37	1297.68	0.5443

(b) Draw a neat sketch of flooded type evaporator. Also compare it with dry expansion evaporator.

(c) The ammonia refrigeration system works on VCR cycle. The refrigerant is subcooled by 5 °C before expansion and superheated by 12 °C before it enters the compressor. Show the cycle on P-H and T-S diagram. Calculate the CoP and power required per kg of refrigerant circulated per minute. Use following enthalpy values :

Enthalpy of Compressor inlet = 1460 kJ/kg

Enthalpy of Compressor outlet = 1796 kJ/kg

Enthalpy at inlet to expansion valve = 322 kJ/kg

6. Attempt any TWO : **12**

(a) Draw a neat sketch practical vapour absorption refrigeration system. State the function of each component.

(b) Explain with neat sketch, summer air conditioning system for the conditions existing at Nagpur City.

(c) Calculate cooling load of Metrology laboratory of your institute.
