Total No. of Questions : 10]

SEAT No. :

P2136

[Total No. of Pages : 4

[5254]-531

B. E. (Mechanical)

REFRIGERATION AND AIR CONDITIONING

(2012 Pattern) (End Semester)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***
5) ***All questions are compulsory.***

Q1) a) In a refrigeration plant working on Bell Coleman cycle, operates between pressure limits of 1.05 bar and 8.5 bar. Air is drawn from cold chamber at 10°C, compressed and then cooled to 30°C before entering the expansion cylinder. The expansion and compression follows the law $pv^{1.3}$=C. Determine the theoretical COP of the system. **[6]**

b) What are the advantages and disadvantages of vapor compression cycle over Bell Coleman cycle. **[4]**

OR

Q2) a) A refrigerating system operates on reversed Carnot cycle. The higher temperature of the refrigerant in the system is 35°C and the lower temperature is – 15°C. The capacity of the system is to be 12 tonnes. Determine the following. **[6]**

i) COP

ii) Heat rejected from the system per hour.

iii) Power required

b) Explain with neat sketch 'Evaporative Coolers'. **[4]**

P.T.O.

Q3) a) The temperature limits of an ammonia refrigerating system are 25°C and –10°C. If the gas is dry at the end of compression. Calculate the coefficient of performance of the cycle assuming no under-cooling of the liquid ammonia. Use the following table for properties of ammonia: **[6]**

Temperature(°C)	Liquid heat (KJ/kg)	Latent heat (KJ/kg)	Liquid entropy (KJ/kg)
25	298.90	1166.94	1.1242
– 10°C	135.37	1297.68	0.5443

b) Define the following terms **[4]**

i) SEER ii) IPLV

OR

Q4) a) Write note on 'Cascade VCC system'. **[5]**

b) In an absorption system heating, cooling and refrigeration takes place at 150°C, 30°C and – 20°C respectively. Find the theoretical COP of the system. If the generator temperature is increased to 190°C and evaporator temperature is decreased to – 30°C, find the percentage change in theoretical COR. **[5]**

Q5) a) 10 cmm air at 37°C DBT, 24 % RH, flow through a desert cooler having an adiabatic efficiency of 75 %. What is the final dry bulb temperature and RH (Relative Humidity), and how much water is required in kg/hr? (USE PSYCHROMETRIC CHART-See page-4,Fig.Q. 5 (a)) **[6]**

b) Write note on 'Human Comfort Chart'. **[4]**

c) Define the following terms. **[6]**

i) SHF

ii) RSHF

iii) DPT (Dew Point Temperature).

OR

Q6) a) On a particular day, the atmospheric air was found to have a dry bulb temperature of 30°C & wet bulb temperature of 18°C. The barometric pressure was observed to be 756 mm of Hg. Without using Psychrometric chart, determine the following properties of moist air. **[6]**

i) RH

ii) the specific humidity

iii) the dew point temperature

iv) the enthalpy of air per kg of dry air. **(USE STEAM TABLE)**

b) Discuss the factors affecting Human Comfort. **[4]**

c) Derive an expression of Bypass Factor of coil **[6]**

Q7) a) Explain with neat sketch **'Summer Air Conditioning System'**. **[6]**

b) Write note on **'Variable Refrigerant Flow System'**. **[6]**

c) Explain working of Capillary tube and list its advantages and disadvantages. **[6]**

OR

Q8) a) Explain with neat sketch **'All Year Air Conditioning System'.** **[6]**

b) Write note on **'Variable Air Volume System'.** **[6]**

c) Explain with neat sketch **'Evaporative Condensers'.** **[6]**

Q9) a) Explain Equal Friction Method of Duct Design. List its advantages and disadvantages. **[5]**

b) A rectangular duct of 0.15 m × 0.12 m is 20 m long and carries standard air at the rate of 0.3 m^3/s. Calculate the total pressure required at the inlet of the duct in order to maintain this flow and the air power required. Take friction factor, f = 0.005. **[6]**

c) Write note on **Fan Laws.** **[5]**

OR

Q10)a) Write a note on Classification of ducts. **[5]**

b) Explain with neat sketch **'Fan Coil Unit'**. **[5]**

c) A circular duct of 40 cm diameter is used to carry air in an air conditioning system at a velocity of 440 m/min. If this duct is to be replaced by a rectangular duct of aspect ratio of 1.5, find out the size of rectangular duct for equal friction method. **[6]**

When

i) Velocity of air in two ducts is same.

ii) The discharge rate of air in two ducts is same.

If f = 0.015, find out the pressure loss per 100m length of the duct. Take the density of air = 1.15 Kg/m^3.

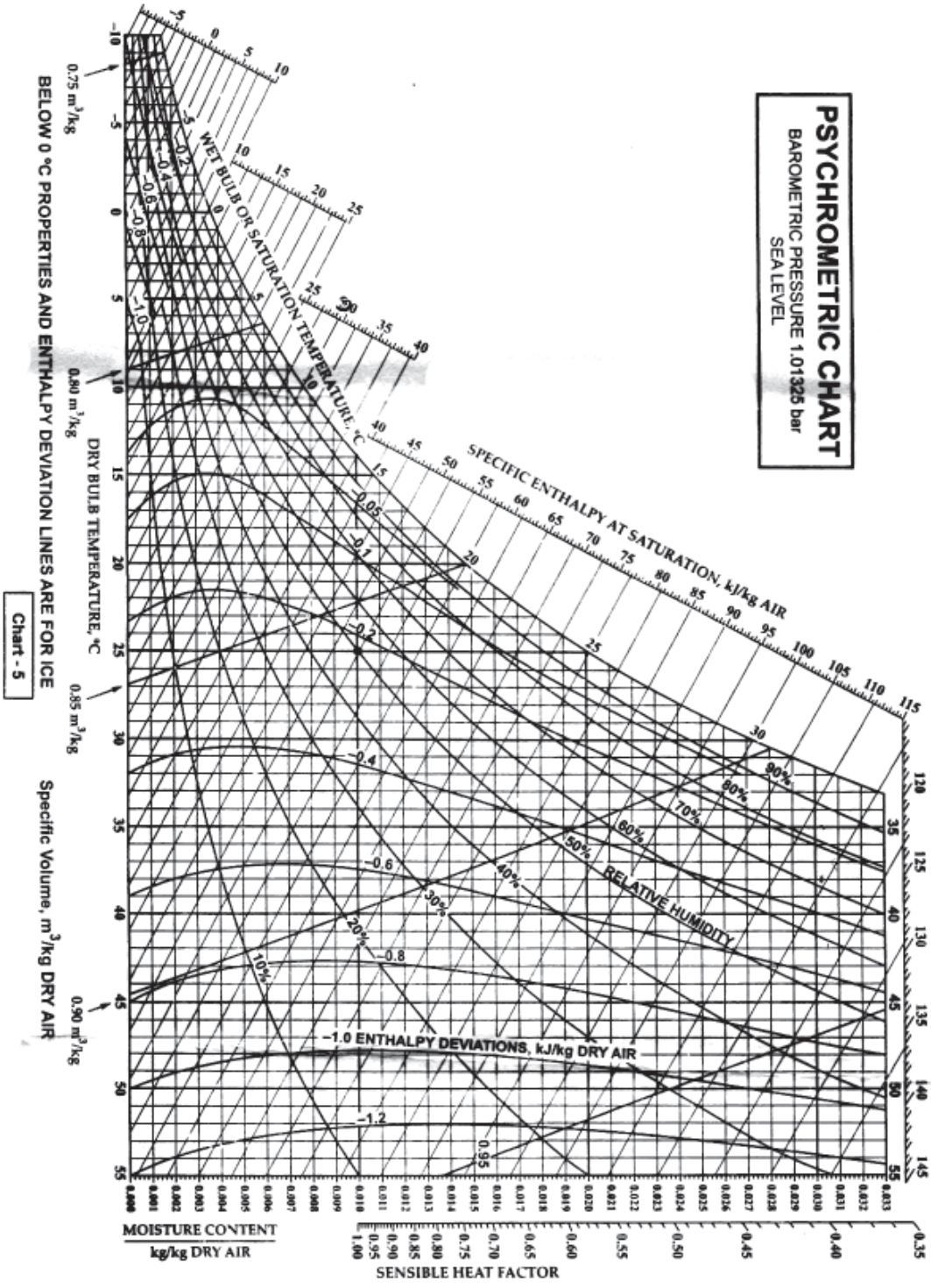

Fig. Q.5 (a) – Psychrometric Chart