國立臺北科技大學

九十四學年度機電科技研究所博士班入學考試

冷凍空調原理試題

填學生證號碼

注意事項：

1. 本試題共五題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. **(30%)** Answer the following questions:
   (a) What is the enthalpy potential?
   (b) What is the straight-line law?
   (c) At what condition, the dry-bulb, the wet-bulb temperatures and the dew point will have the same value.
   (d) What are the effects of partial miscibility refrigerant-lubricant solutions in refrigerant systems?
   (e) What is Lorenz refrigeration cycle? Is there any difference between Lorenz and Carnot refrigeration cycle?

2. **(20%)** An enclosed swimming pool has a sensible heat loss of 88 kW and a latent heat gain of 110 kW on a design day when the outdoor air is at 2°C and 20 percent relative humidity. The space is to be maintained at 24 °C and 50 percent relative humidity. Outdoor air is to be heated to 16 °C, mixed with recirculated air from the conditioned space and the mixed air heated to supply conditions.
   (a) At what rate, is the air supplied to the space if the supply air temperature is 35 °C?
   (b) At what rate, is outdoor air and recirculated air flowing?
   (c) What is the heat transfer rate for the preheat process?
   (d) What is the heat transfer rate for the mixed air heating process?

3. **(20%)** An R-717 two-stage system (**Figure 1**) with flash-gas removal and intercooling provides 200 kW of refrigeration at an evaporating temperature of -40°C when operating with a condensing temperature of 35°C.
   (a) What are the optimum intermediate pressure and temperature?
   (b) Compute the flow rates through each compressor.
   (c) What are the power requirements of the compressors?
   (d) What would be the power required in a single-stage R-717 system with these evaporating and condensing temperatures, and the percentage saving in power through the use of a two-stage system?

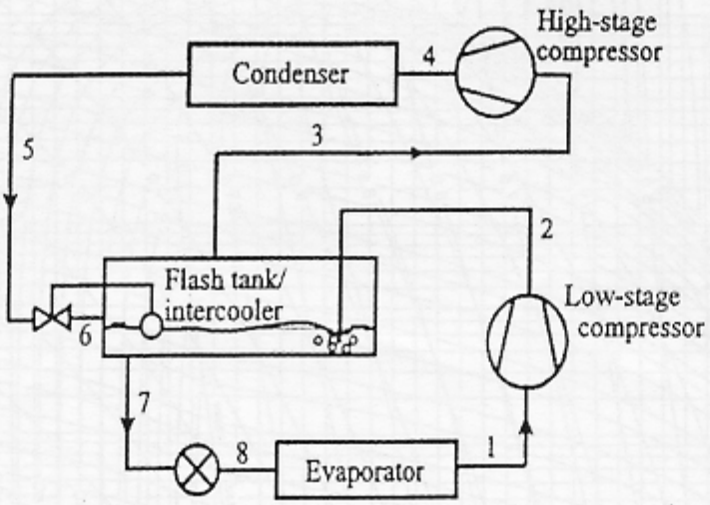


Figure 1

4. **(15%)** Show that the coefficient of performance of the ideal absorption cycle is

$$COP = \frac{T_r}{(T_a - T_r)}\left(1 - \frac{T_a}{T_s}\right)$$

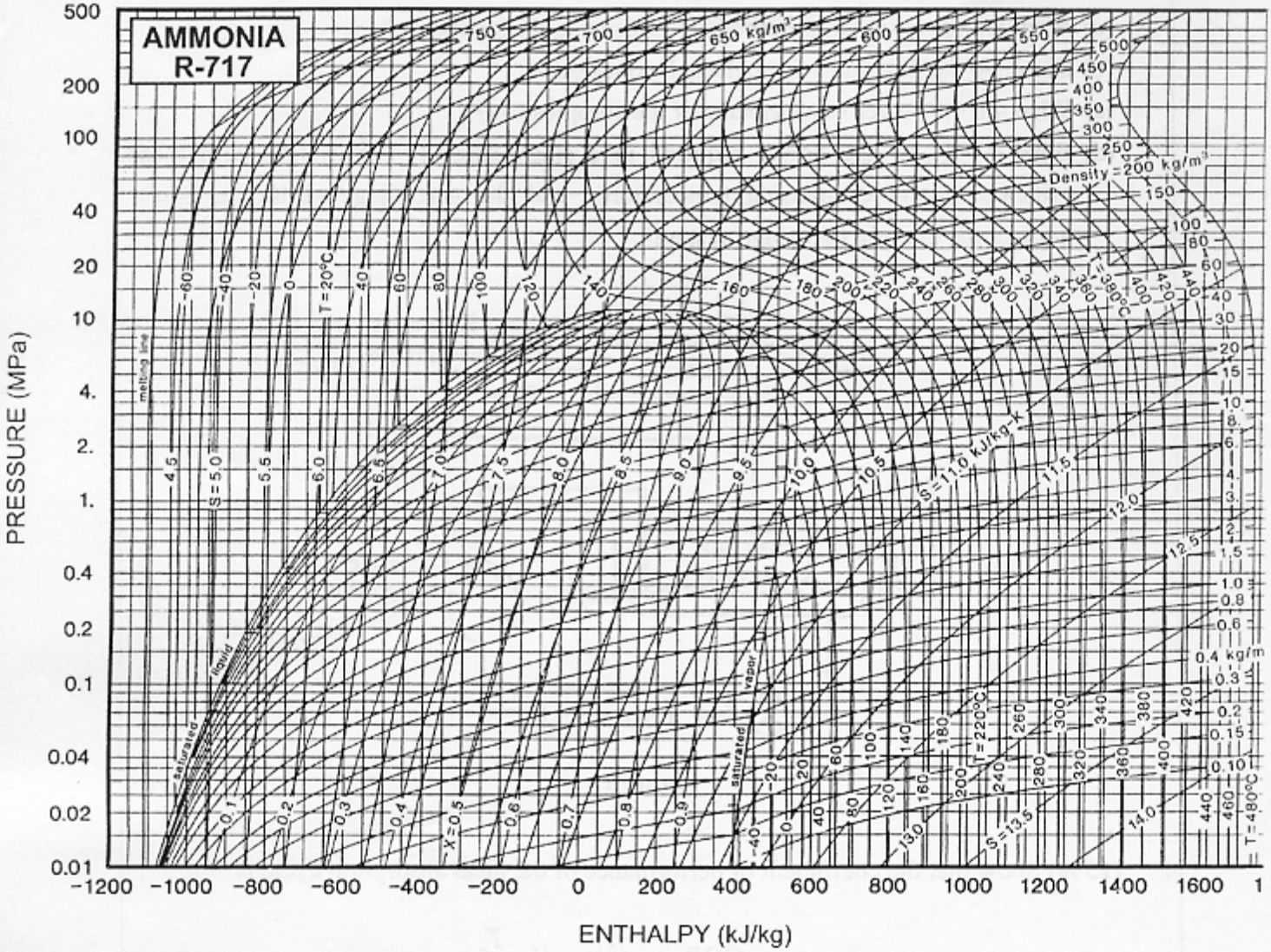
where T_r is the evaporating temperature of evaporator, T_a is the surrounding temperature, and T_s is the absolute temperature.

5. **(15%)** Show that the humidity ratio ω can be express as

$$\omega = 0.622 \frac{P_s}{P_t - P_s}$$

where P_s is the partial pressure of dry air and P_t is the atmospheric pressure.

注意：背面尚有試題


AMMONIA
R-717
PRESSURE (MPa)
ENTHALPY (kJ/kg)
500
200
100
40
20
10
4.
2.
1.
0.4
0.2
0.1
0.04
0.02
0.01
−1200
−1000
−800
−600
−400
−200
0
200
400
600
800
1000
1200
1400
1600
melting line
saturated liquid
saturated vapor
T = 20°C
T = 220°C
T = 480°C
Density = 200 kg/m³
650 kg/m³
S = 5.0
S = 11.0 kJ/kg-K
S = 13.5
X = 0.5

1-4

ASHRAE PSYCHROMETRIC CHART NO. 1

NORMAL TEMPERATURE SEA LEVEL

BAROMETRIC PRESSURE 101.325 kPa.