國立臺北科技大學 102 學年度碩士班招生考試

系所組別：1410 能源與冷凍空調工程系碩士班甲組

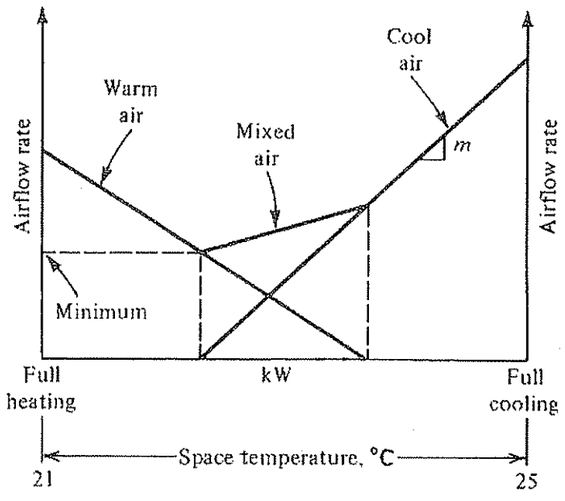
第二節　冷凍空調原理　試題

注意事項：

1. 本試題共五題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

(1)(15%) Air at standard atmospheric pressure and a temperature of 20°C flowing with a velocity of 12 m/s enters a sudden enlargement where the duct area doubles. What is the increase in static pressure of the air as it passes through the enlargement?

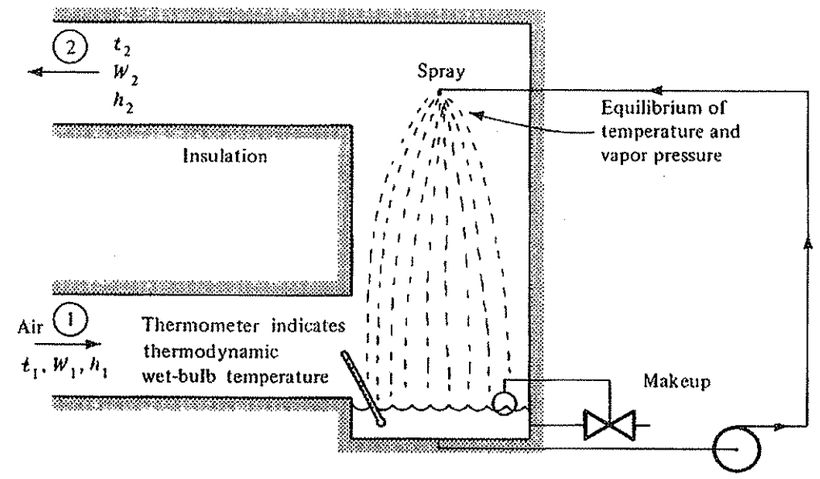
(2)(15%) In a VAV dual-duct system the flow is controlled by the design as shown in the following figure. Explain the system characteristics, and how to assure the minimum airflow rate.



(3)(15%) An adiabatic saturator with the operating states is shown below. Derive that:

$$h_1 = h_2 - (W_2 - W_1)h_f \quad .$$

Where h is the air enthalpy, W is the relative humidity and h_f is the enthalpy of makeup water.



(4)(25%) The sensible- and latent-heat gains in a space served by a single-zone air conditioner are 65 and 8 kW, respectively. The space is to be maintained at 24°C and 50% relative humidity. The design conditions of outside air are 35°C dry-bulb and 25°C wet-bulb temperatures. For ventilation purposes outdoor air is mixed with recirculated air in a 1:4 proportion. When mixed air at the resulting conditions enters the cooling coil, the outlet air conditions are a function of the temperature of the chilled water supplied to the coil, as indicated in the table below. Determine:

(a)(8%) The air conditions entering the coil.

(b)(8%) The air conditions leaving the coil and the required temperature of the supply chilled water.

(c)(9%) The cooling capacity of the coil.

	Air leaving temperatures, °C	
Chilled-water-supply temperature, °C	Dry bulb	Wet bulb
4.0	10.7	10.5
5.0	11.6	11.5
6.0	12.5	12.4
7.0	13.3	13.2

注意：背面尚有試題

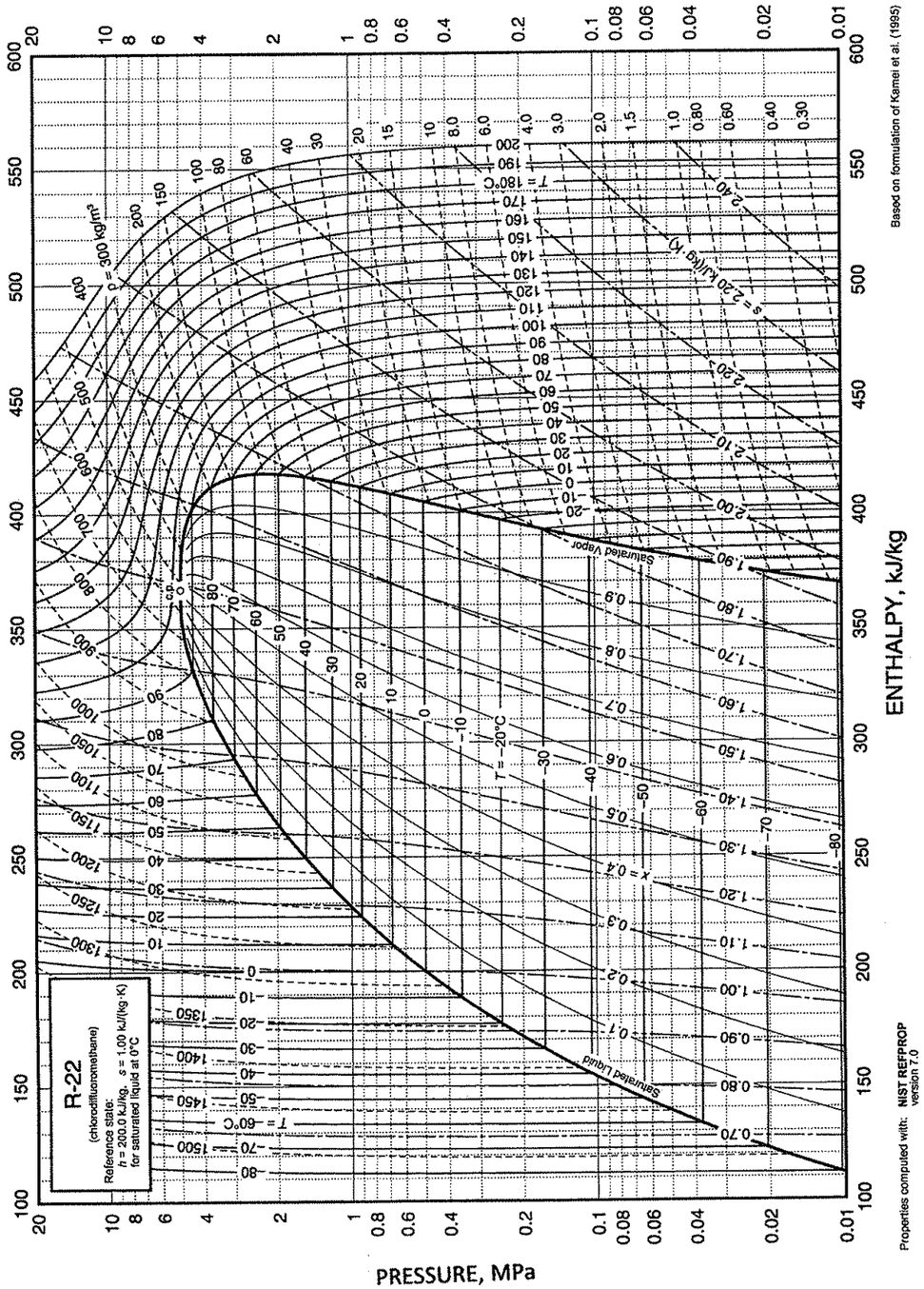
(5)(30%) A refrigerant 22 vapor-compression system includes a liquid-to-suction heat exchanger in the system. The heat exchanger warms saturated vapor coming from the evaporator from -10 to 5°C with liquid which comes from the condenser at 30°C. The compressions are isentropic in both cases listed below.

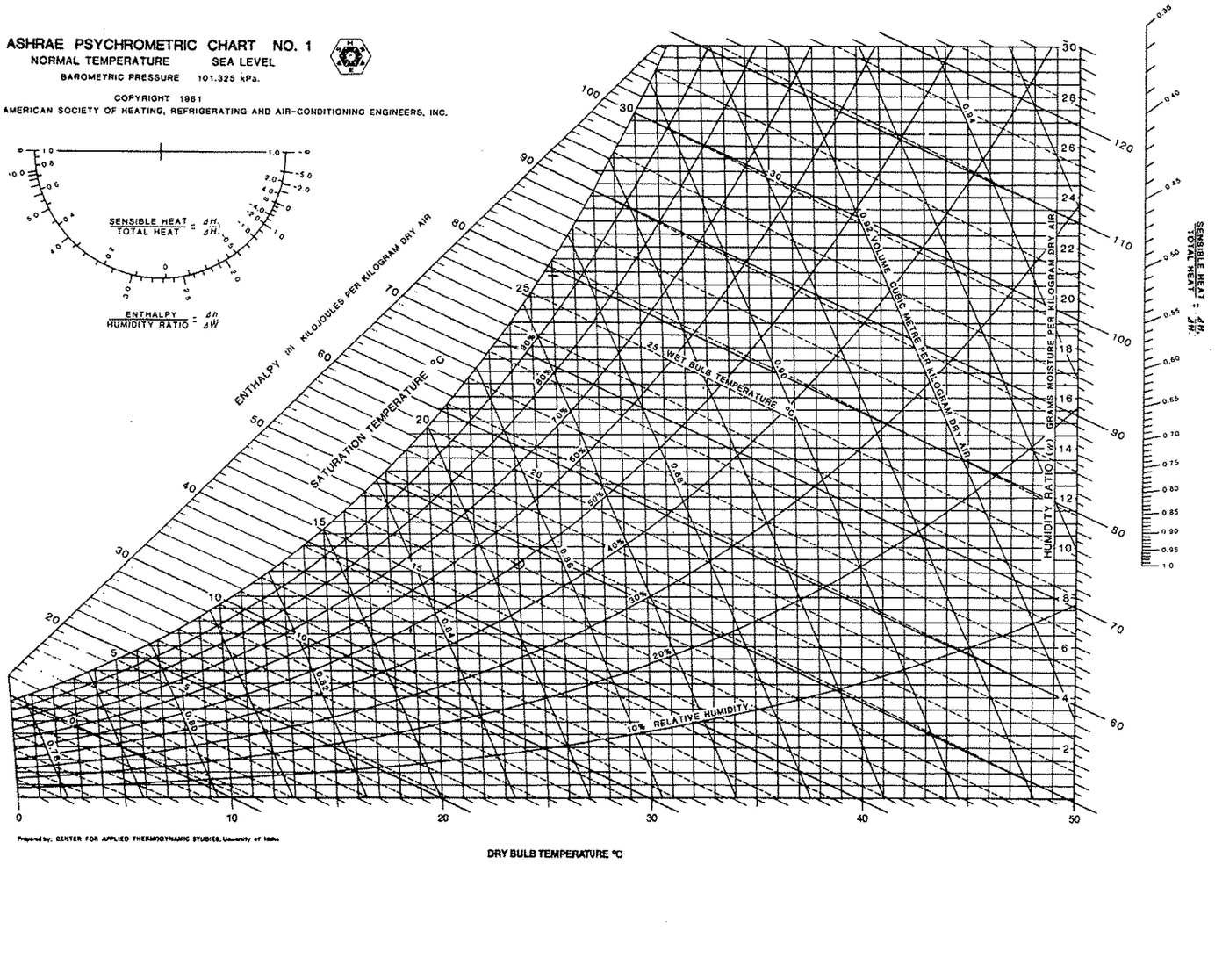
(a)(7%) Calculate the coefficient of performance of the system without the heat exchanger but with the condensing temperature at 30°C and an evaporating temperature of -10°C.

(b)(7%) Calculate the coefficient of performance of the system with the heat exchanger.

(c)(8%) If the compressor is capable of pumping 12.0 L/s measured at the compressor suction, what is the refrigeration capacity of the system without the heat exchanger?

(d)(8%) With the same compressor capacity as in (c), what is the refrigeration capacity of the system with the heat exchanger?




ASHRAE PSYCHROMETRIC CHART NO. 1
NORMAL TEMPERATURE
SEA LEVEL
BAROMETRIC PRESSURE 101.325 kPa.
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AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.
SENSIBLE HEAT / TOTAL HEAT = ΔH / ΔH
ENTHALPY / HUMIDITY RATIO = Δh / ΔW
ENTHALPY (h) KILOJOULES PER KILOGRAM DRY AIR
SATURATION TEMPERATURE °C
HUMIDITY RATIO (W) GRAMS MOISTURE PER KILOGRAM DRY AIR
SENSIBLE HEAT / TOTAL HEAT = ΔH / ΔH
WET BULB TEMPERATURE °C
0.92 m³/kg VOLUME CUBIC METRE PER KILOGRAM DRY AIR
RELATIVE HUMIDITY
10% RELATIVE HUMIDITY
DRY BULB TEMPERATURE °C
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