ERRATA for

PE Mechanical Engineering: HVAC and Refrigeration Practice Exam

ISBN: 978-1-947801-02-8

Errata posted 04/01/2024

Revisions are shown in red.

Question 8, p. 12:

Leaving-Air Temperatures should read as follows:

Leaving-Air Temperature
55.0°F db/47.3°F wb
55.0°F db/50.8°F wb
55.0°F db/53.2°F wb
55.0°F db/54.1°F wb

Question 36, p. 26:

A building air-conditioning system requires 10,000 cfm of outside air for ventilation. An enthalpy wheel, as shown, exchanges both sensible and latent heat energy to reduce the design load on the building refrigeration system. If the enthalpy wheel has 2% losses, the final reduced design load (tons) on the refrigeration system is most nearly:

Question 52, p. 36:

A house is conditioned with an air-to-air heat pump. Electric supplemental heating is used when the heat pump cannot provide sufficient heat. The design heat loss of the house is 60,000 Btu/hr at 70°F indoors and 0°F outdoors. At 17°F, the heat pump has a heating capacity of 40,000 Btu/hr and a COP of 2.64. The required supplemental electric heat (kW) at 17°F is most nearly:

- ○ A. 1.59
- ○ B. 6.0
- ○ C. 10.3
- ○ D. 13.3

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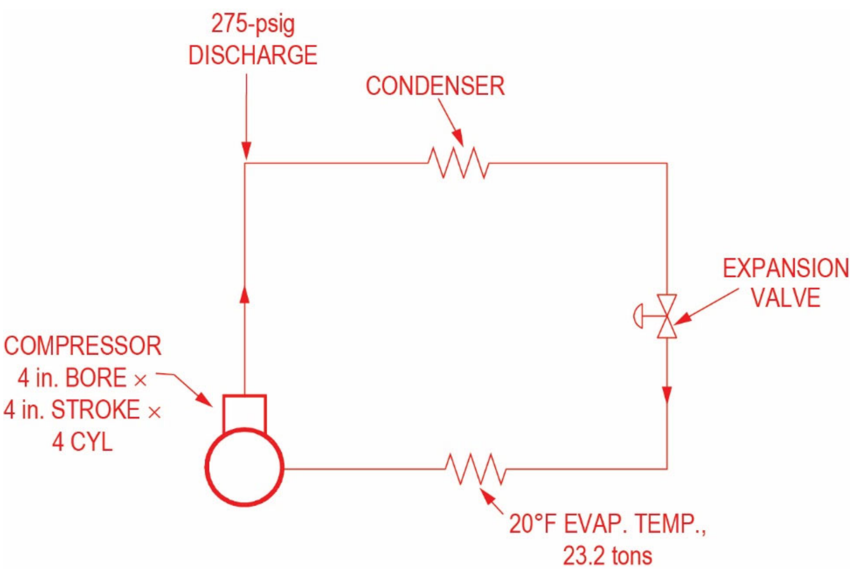
Question 69, p. 44:



Solution 8, p. 60:

LAT db is given as 55°F.
LAT wb is calculated.
EAT db is calculated.

$$\text{EAT} = \text{Mixed Air Temperature (MAT)} = \frac{78^\circ\text{F}(2{,}900\ \text{cfm}) + 92^\circ\text{F}(700\ \text{cfm})}{3{,}600\ \text{cfm}} = 80.7^\circ\text{F db}$$

From sea level psychrometric chart at 80.7°F db: MAT wb = 66.2°F; h_{ma} = 30.99 Btu/lb

From sea level psychrometric chart at 78°F db; rh = 45%; h_{ra} = 28.5 Btu/lbm

At outdoor air conditions of 92°F db/76°F wb, h = 39.4 Btu/lb

Q_T for outdoor air = (4.5) cfm (Δh) where cfm = 700 and h = $h_{oa} - h_{ra}$

= (4.5)(700)(39.4 – 28.5) = 34,335 Btu/hr

Q_T for system = SH + LH + OA = 90,000 + 40,000 + 34,335 = 164,335 Btu/hr

Q_T for system = (4.5) cfm (Δh); solve for Δh

$$\Delta h = \frac{164{,}335}{4.5(3{,}600)} = 10.14\ \text{Btu/lb}$$

Therefore, leaving air h = 30.9 – 10.14 = 20.76 = h_{la}

From sea level psychrometric chart at h = 20.76 Btu/lb and 55°F db: 50.8°F wb

EAT = 80.7°F db/66.2°F wb; LAT = 55°F db/50.8°F wb

THE CORRECT ANSWER IS SHOWN ABOVE.

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Solution 52, p. 75:

Heat loss at 17°F is 60,000 $\times\left(\frac{70-17}{70-0}\right) = 45,429$ Btu/hr

Heat pump capacity at 17°F is 40,000 Btu/hr

Auxiliary heat capacity required is 45,429 – 40,000 = 5,429 Btu/hr

1 Btu/hr = 0.00029307 kW = 1.59 kW

~~Heat pump energy usage 40,000/2.64 = 15,152 Btu/hr~~

~~= 4.43 kW~~

~~1.59 + 4.43 = 6.02 kW~~

THE CORRECT ANSWER IS: A