MEBS6006 Environmental Services I

http://me.hku.hk/msc-courses/MEBS6006/index.html

Self-evaluation Exercises

1. Dr. Willis Haviland Carrier (1876-1950) started the science of air conditioning in the early 1900s. Which of the followings is NOT an invention by Dr. Carrier?

   (a) Rational psychrometric formulae (b) Centrifugal chiller

   (c) Residential room air-conditioner (d) Variable air volume (VAV) system

2. For easy understanding, air-conditioning systems can be divided into five sub-systems or loops. List down the five sub-systems in the space below.

   _____

   _____

3. The humidity of air can be assessed using various different parameters. Which of the following parameters for air humidity has a close relationship with the energy content or enthalpy of the moist air?

   (a) Moisture content (b) Relative humidity

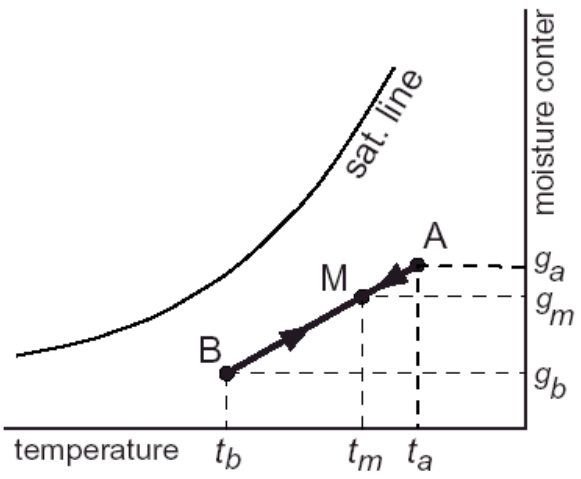
   (c) Wet-bulb temperature (d) Dew-point temperature

4. Percentage saturation and relative humidity are often used for specifying the humidity conditions of air. There is a slight difference between them because of the basic definition in the ratio of air sample to saturated air. Fill in the blanks below to explain this difference.

   i) Percentage saturation is the ratio of _____.

   ii) Relative humidity is the ratio of _____.

5. At the air-handling unit of an air conditioning system, the outdoor air (at condition A) is mixed with the return air (at condition B) in a ratio of 1 : 9. Based on the following data, estimate the temperature, moisture content and enthalpy of the mixed air stream (at condition M).



t_a = 33 °C h_a = 89.3 kJ/kg
t_b = 25 °C h_b = 50.3 kJ/kg

g_a = 0.022 kg/kg
g_b = 0.010 kg/kg

Mixed air conditions:

t_m = _____

g_m = _____

h_m = _____

6. In the study of thermal comfort, which of the following temperature could integrate the effect of dry sensible heat exchange, radiation heat exchange and air movement?

(a) Mean radiant temperature (b) Operative temperature

(c) Effective temperature (d) Equivalent temperature

7. Which of the following contains a parameter which is not a criterion for predicting thermal comfort using the Fanger's comfort equation?

(a) Metabolic rate and clothing (b) Air temperature and water vapour pressure

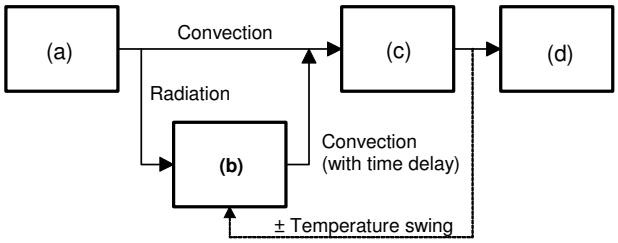
(c) Air velocity and mean radiant temperature (d) Mean skin temperature and air humidity

8. Write down the four basic components of cooling coil load for a typical air conditioning cycle of a central all-air system running in the summer mode.

_____

_____

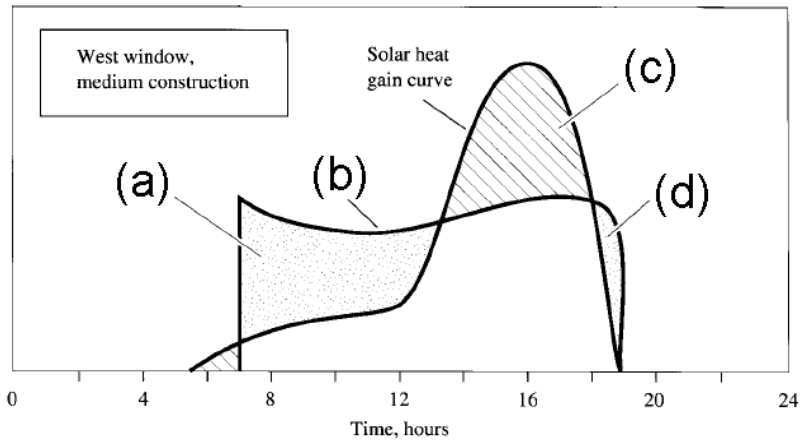
9. The diagram below shows the basic principles of cooling load calculation. Fill in the blanks below for the terms represented by (a) to (d) in the diagram.



(a) _____ (b) _____

(c) _____ (d) _____

10. The diagram below shows the solar heat gain and cooling load curves at a west window of a building. Fill in the blanks below for the elements represented by (a) to (d) in the diagram.



(a) _____ (b) _____

(c) _____ (d) _____