MEBS6006 Environmental Services I (2007-2008)

SECTION A (Numerical Answers)

A1. (a)   Not applicable.
   (b)   i) Humidity ratio or moisture content:
        Initial = 0.0135 kg/kg ; final = 0.0101 kg/kg
      ii) Wet-bulb temperature: Initial = 21.2 °C ; final = 14.5 °C
      iii) Specific enthalpy: Initial = 61.5 kJ/kg ; final = 40.7 kJ/kg
      iv) Specific volume: Initial = 0.87 m^3/kg ; final = 0.83 m^3/kg
      v) The kW of refrigeration required = 41.3 kW
     The apparatus dew point = 13.8 °C
   (c)   Not applicable.

A2. (a)   Not applicable.
   (b)   i) Mixed air stream (m):
        - Dry-bulb temperature = 28.25 °C
        - Moisture content = 0.0131 kg/kg
        - Specific enthalpy = 63.6 kJ/kg
      ii) Air-conditioning process (s – r):
        - Sensible load = 24.5 kW
        - Latent load = 11.5 kW
        - Total load = 36 kW
        - Sensible heat ratio = 0.68
      iii) Ventilation load = 20.9 kW
        Supply system heat gain = 5.0 kW
        Return system heat gain = 4.6 kW
   (c)   Not applicable.

A3. (a)   Not applicable.
   (b)   i) Amount of the energy saving obtained from
       - "cooling" = 32,600 kWh; "lights" = 23,500 kWh
      ii) Density of the peak design cooling loads:
       - Reference case = 11.36 m^2/kW; Low-energy case = 17.86 m^2/kW
   (c)   Not applicable.

MEBS6006 Environmental Services I (2004-2005)

SECTION A (Numerical Answers)

A1. (a)   Not applicable.
   (b)   Not applicable.
   (c)   DBT = 26.05 °C; Moisture content = 12.2 g/kg; Dew point temp. = 17 °C
     Specific enthalpy = 57.2 kJ/kg

A2. (a)   Not applicable.
   (b)   Not applicable.
   (c)   Sensible heat ratio = 0.75

A3. (a)   Not applicable.
   (b)   Not applicable.
   (c)   Sensible heat ratio = 0.59; Design flow = 5.6 m^3/s
     Energy utilization index = 176 kWh/m^2/year; % of HVAC system = 48.9%