EVDS 629 - Environmental Control Systems Winter/96
Final Exam 96 04 23

This is an open book exam. The use of sketches is encouraged where it is not required.

1. 10% A process is plotted on the attached psychrometric chart. Explain what is happening to the air as it passes:

   (a) from point A to point B

   (b) from point B to point C

   (c) from point C to point D.

2. 10% What options does an architect have in manipulating the use of glass to reduce nonrenewable energy use in a commercial building?

3. 10% Can a building envelope be too air-tight? Explain.

4. 10% Explain the most effective approach to reducing fossil fuel use in a 150 m^2 dwelling for Calgary. Your response should include system choices and some explanation of building details.

5. An eight-storey office building has a floor plate 30 m deep and 80 m long.

10% a) Sketch out an air handling arrangement for the project in plan and section.

5% a) Sketch out the locations of the main thermal treatment and air-handling components.

10% b) Explain the rationale for your approach.

5% c) Show the use of rules of thumb to determine the required cross-sectional area of main ducting at the largest point. Explain the rule of thumb used (e.g., give text, page no. or explain the basis of the rule of thumb).

5% d) Show the use of rules of thumb to determine the required cooling capacity. Explain the rule of thumb used (e.g., give text, page no. or explain the basis of the rule of thumb).

6. 15% Calculate the heat loss per hour from a warehouse. The building is 20 m long, 10 m wide and 4 m high. The wall materials are:

   Aluminum siding
   Rigid insulation, 5 cm
   Concrete block, 20 cm

   The U-value for the roof is 0.2 W/m-K. Infiltration produces 0.2 air changes per hour.

Inside temperature is 20 degrees Celsius, outside temperature is -10 degrees Celsius.

7. Explain any two of the following, giving a sample application:

5% (a) equivalency

5% (b) performance standard

5% (c) heat recovery ventilator

5% (d) ground source heat pump