

**The University of Calgary
Department of Mechanical Engineering**

**ENME 583 Mechanical Systems in Buildings
Winter Session 1998-99
Test 1, 1998 02 09 OPEN BOOK**

1. The fan with the characteristics shown in Figure 12-8 of McQuiston and Parker is being considered for a couple of applications.
 - (a) If it is required to move 6000 cfm (3000 l/s) at 2 in (500 Pa) total pressure, 10% would it be a good choice? Explain briefly.
 - (b) Do conditions improve or deteriorate if the static pressure is decreased 10% to 1.5 in (365 Pa)? Explain.
2. The attached chart has some key points plotted for a cooling scenario. "A" is the room design condition. "B" is the room apparatus dew point. "C" is the temperature of the make-up and return air streams after adiabatic mixing. Assume that the by pass factor may be ignored. The latent load is 25 kW.

Note that the solutions to parts "a" and "b" are independent.

- (a) What is the sensible cooling load (clearly explain the steps in your solution, 15% including both graphing and calculations as appropriate)?
 - (b1) If the ventilation air and outside air supply are both 2000 l/s, what 15% will the outside air condition be (give sufficient information to plot it on the psychrometric chart)
 - (b2) What is the change in enthalpy of outside air from the point it enters the building 20% until it leaves the cooling coil? Show all steps in your determination.
3.
 - (a) Why are cooling towers used in some buildings and not in others? 10%
 - (b) Would it be possible to operate an office building without a chiller? Explain 10%
 - (c) How do variable air volume systems and terminal reheat systems compare in term 10% efficiency for use in Calgary? Explain briefly.