Mansoura University		Mechanical Power Engineering Department Total Marks : 70	Faculty of Engineering
Course title: Heat Transfer and Air Conditioning			Course Code: 6124
Date: May, 2014 (2nd term)		Allowed time : 3.0 hrs	No. of Pages: 1 (Open source)
Remarks: (Answer the following questions, and assume any missing data)			

دعاء عند بداية الإجابة

رب اشرح لي صدري ويسر لي أمري واحلل عقدة من لساني يفقهوا قوْلي .. بسم الله الفتاح.. اللهم لا سهل إلا ما جعلته سهلاً وأنت تجعل الحزن إذا شئت سهلاً يا أرحم الراحمين.

Question No. 1 (10Marks)

Atmospheric air is at dry bulb temperature of $25^{o}C$ and relative humidity of 50%, find the following.

a- Dew point temperature

b- Specific humidity

c- Enthalpy

d- Wet bulb temperature

e- Saturation pressure and vapour pressure.

Question No. 2 (10 Marks)

10 cmm of moist air at $15^{o}C$ DBT and $13^{o}C$ WBT is mixed with 12 cmm of moist air at $25^{o}C$ DBT and $18^{o}C$ WBT.

1. State if there will be condensation or no.

2. Find the condition of the resulting mixture.

Question No. 3 (5 Marks)

Moist air at $25^{o}C$ and 70% enters a device and leaves at $34^{o}C$ and 30%.

1. What is the type of this process?

2. What is the device which can achieve this process?

Question No. 4 (10 Marks)

Moist air at $35^{o}C$ and 50% is needed to be sensibly cooled to $20^{o}C$.

1. Draw the process on the psychrometric chart.

2. Find the condition of the cooled air.

3. Find the heat which has to be removed from the air stream.

4. If a cooling coil is used. State the constraints on the cooling coil temperature.

5. What other devices can be used for achieving this process.

Question No. 4 (15 Marks)

a- Draw the flow diagram of a summer air conditioning system and plot the processes on the psychrometric chart.

b- Draw the flow diagram of all year air conditioning system and list in a table which components of the system will be operating during summer and winter.

c- Define the dew point temperature, specific humidity, relative humidity and wet bulb temperature.

Question No. 4 (20 Marks)

For the following composite wall and assuming steady heat transfer processes,

1. Draw the equivalent thermal circuit for this composite wall.
2. Calculate the over all thermal resistance between T_{air} and T_4.
3. Calculate the heat transfer rate throw the composite wall.
4. Calculate the temperatures T_1, T_2, T_{air}.

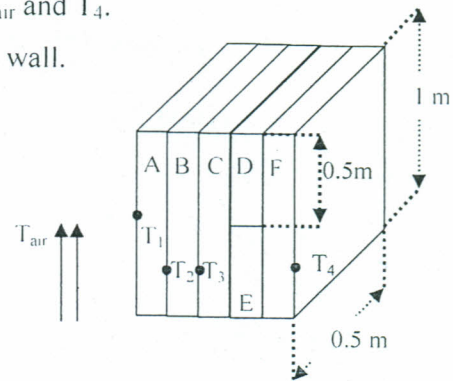Use the following data,

Thickness of each layer is 10 mm

$T_4 = 150\ ^\circ C$ and $T_3 = 60\ ^\circ C$

$k_A = k_F = 100\ \ W/mK$

$k_B = k_E = 10\ \ \ W/mK$

$k_C = k_D = 0.5\ \ W/mK$

$h = 20\ W/m^2K$

End of Exam

With my best wishes
Dr. Ahmed Ramzy