Air-Conditioning & Refrigeration

BSc

Lecture 10

Course weekly Outline &

Ch.1 (Introduction to Air conditioning & Refrigeration)

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Q1 An air conditioned space is maintained at DBT= 24 ^{o}C and RH=50%. The outside condition is DBT=0 ^{o}C with 0 moister content the flow rate as a percentage 25 % fresh air to 75 % return air. The mixed air is humidified by an Air washer has a saturation efficiency 80% then supplied to the space across a re-heater at 34. ^{o}C the volumetric flow rate of supplied air 47 m^3/s.

Calculate all the results by equations and compare them with the results gain from psychometric chart:

a) Find the conditions for all points.
b) The make up water.
c) Draw the process on psychometric chart.
d) The re-heater load.

Q1/

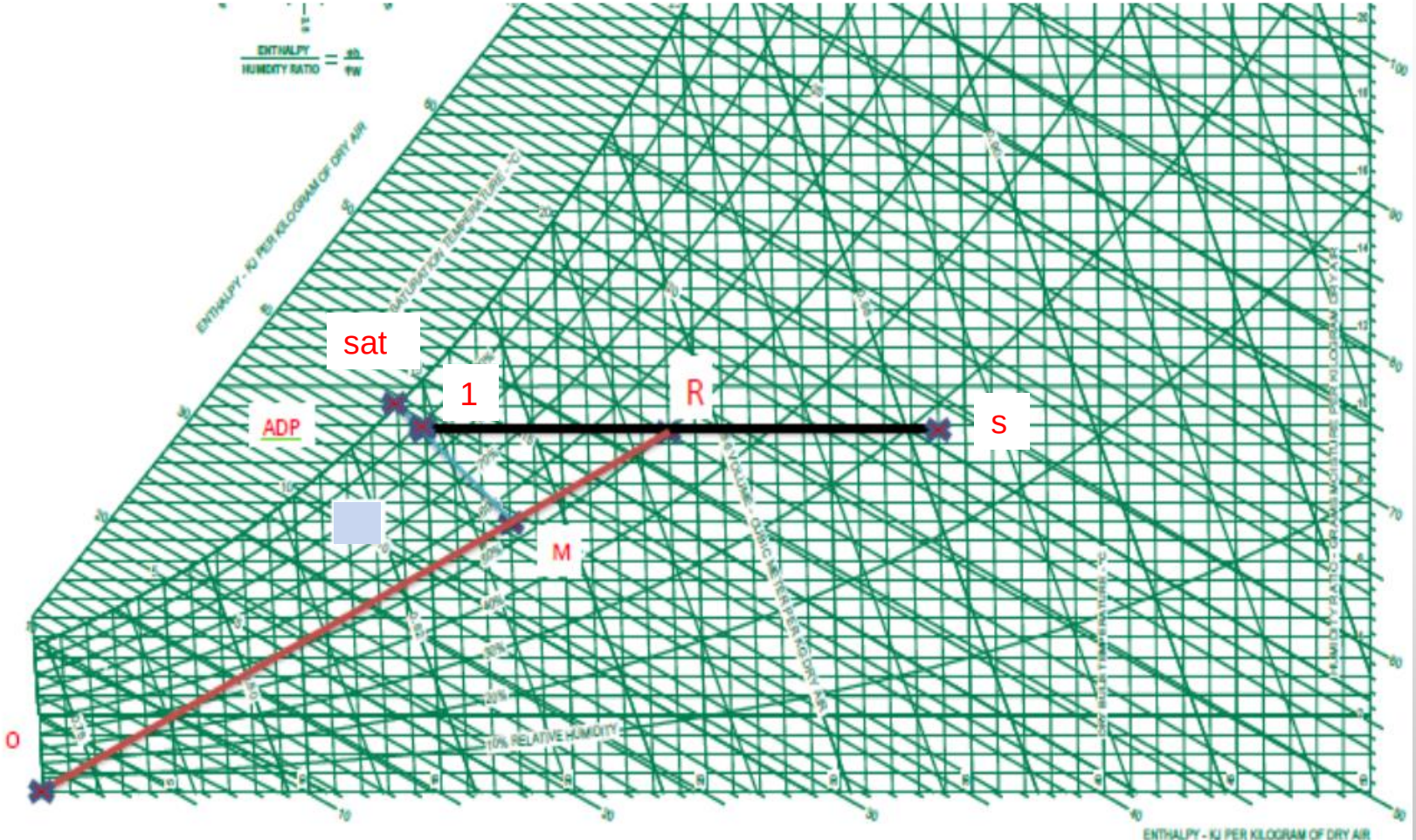
Tm=(To*Vo + Tr*Vr)/(Vr +Vo) ,,Tm=(0.25*0 +0.75*24)/1=18 C

ξ= (ws-wm)/(wsat-wm) ,, W1=Ws=Wr (heating)

0.8=(0.009336-0.007)/(Wsat-0.007) ,,Wsat=0.013

Mmake up=Ms*(W1-Wm)=47*1.2*(0.009336-0.007) =0.1317Kg/s

Qre heat=Ms(hs-h1)=56.4*(58-40)=1015.2kW



Q2 The following data apply to an air-conditioning system Q_s=11.6 kW Q_L=11.6 kW.

Inside condition 25^{o}C & RH=50% & outside condition 35^{o}C DBT & 28^{o}C WBT.

Return air from the room is mixed with the outside air before entering the cooling coil a ratio 5:1

Return air from the room is mixed with the air leaving the cooling coil at a ratio 1:5 , cooling coil bypass factor =0.1. The air may be reheated if necessary before supplying to the condition space, assume T_{dp}=10^{o}C.

Find

a) Supply air condition to the room. b) Refrigeration load (cooling coil load).

c) Total refrigeration capacity. d) The quantity of fresh air supplied.

Q2 /Tm1=To*Vo+Tr*Vr/Vtotal=(35*1+25*5)/6=26.667 C

B=(Ts1-TADP)/(Tm1-TADP) , 0.1=(Ts1-10)/(26.667-10), Ts1=11.8C

Tm2=Tr*Vr+Ts1*Vs1)/Vtotal=25*1+11.8*5)/6=14C

Draw from Room line SHR=11.6/(11.6+11.6)=0.5 which interact heater supply line to room at S2=20

Qs=1.22*Vs(Tr-Ts2),, 11.6=1.22*Vs(25-20),,Vs=1.9 m3/s

Vso=Vs*(1/6)=0.3166 m3/s

Qcool=1.22*Vs*(hm1-hs1)=1.22*1.9*(58-35)=53.314kw

Qtotal=Qcool+Qheater=Qcool+1.22*Vs(Ts2-Tm2) Qtotal=53.314+1.22*1.9*(20-14)=67.222kw