Menoufia University
Faculty of Engineering
Shebin El-Kom
2nd Semester, 2016-2017
Higher Diploma Exam

Minuflya University

Mechanical Power Engineering Department
Subject: MPE505
Using computer in Cooling Air
Date: 03/06/2017
Time Allowed: 3 hours

1. **Personal Laptop and all Refrigeration and Air Conditioning Software, tables and charts, and handwrite list of equations belong the students are allowed.**
2. **Please assume any missing data you need for complete your design.**

كل خصائص الهواء وحسابات دورات التبريد وتكييف الهواء باستخدام برامج الحاسب الآلي فقط

Cool tools cycle analysis: put the inlet and output data windows in your answer sheet.

Question (1)   (5+15 Marks)

a. Refrigeration and air conditioning software that can be used for designing, dimensioning, analyzing and optimizing are widely used recently, discuss this statement and mention some famous software in this area.

b. Moist air at 101.325 kPa pressure has a dry bulb temperature of 34 ^{o}C and relative humidity of 65 %. Determine, (a) dew point temperature, (b) wet bulb temperature, (c) the humidity ratio, (d) specific enthalpy, specific volume, and dynamic viscosity.

Question (2)   (10+10 Marks)

a. Simple refrigeration system uses Freon R-134a, evaporating temperature is -10 ^{o}C, condensing temperature of 35 ^{o}C and refrigeration capacity of 2 TR. Locate the p-h diagram of the cycle and estimate; (a) refrigerant mass flow rate, (b) condensing heat load, (c) compression work, and (d) the coefficient of performance.

(a) Repeat the solution of (a) if the vapor is superheated 5 ^{o}C, and subcooled 10 ^{o}C. The pressure drop in suction valve is 0.3 bar and delivery valve is 0.5 bar. Assume the compression process is adiabatic with $\eta_c = 0.9$.

Question (3)   (5+15 Marks)

(a) Represent the cooling and dehumidification process of moist air on psychrometry.

(b) Moist air in cooling and dehumidification process with volume flow rate of 0.5 m^3/s enters the cooling coil at 35 ^{o}C dbt and 70 % RH and leaves at 10 ^{o}C dbt and 85 % RH. Find, (a) The cooling demand, (b) Sensible Heat load, (c) latent heat load for the process, (d) sensible heat factor of the process, SHF, and By-pass factor, BPF, of the cooling coil.

Cool tools auxiliary: put the inlet and output data windows in your answer sheet.

Question (4)   (20 Marks)

Calculate the cooling demand for the cold room of $15 \times 10 \times 4$ m. The room is maintained at 2 ^{o}C dbt and 80 % RH to cool 10 ton of vegetables and fruits from 35 ^{o}C dbt. Assume the required data as the software need to complete your solution.

Question (5)   (20 Marks)

Calculate the cooling demand for an air conditioned room of $8 \times 6 \times 4$ m. The number of occupants are 15. The room is maintained at 24 ^{o}C dbt and 50 % RH, and the ambient conditions is 39 ^{o}C dbt and 40 % RH. Assume the required data as the software need to complete the your solution.

With my best wishes