البحث المرجعي (2019/2020)

(a) No. of pages: 8 - No. of questions: 7
(b) The total exam mark is 100.

برنامج الميكاترونيات والروبوتات
كلية الهندسة
المادة منظومات تكييف الهواء
الفصل الدراسي الثاني 2019- 2020
الاسم: .....
الدرجة: .....
التقييم: .....

تعليمات وإرشادات مهمة:

1. يقوم كل طالب بطباعة النموذج وكتابة اسمه بصفحة الغلاف في المكان المحدد لذلك.
2. يقوم كل طالب بالإجابة على جميع الاسئلة بخط اليد وأن تكون الإجابة بخط واضح والرسومات بالرصاص.
   - الاجابة على الأسئلة في الفراغات المخصصة لذلك بعد كل سؤال.
3. يقوم كل طالب بتحويل النموذج إلى ملف بصيغة Pdf ويكون بجودة عالية.
   - تسمية الملف باسم الطالب وأن يكون اسم الملف باللغة العربية.
4. يقوم كل طالب بإرسال الملف عن طريق البريد الإلكتروني لدكتور عثمان حسن عثمان طبقا للتوقيتات المعلنة من إدارة الكلية.

البريد الالكتروني Othman.hassan@eng.aun.edu.eg

- مع وضع الجملة التالية (البحث المرجعي منظومات تكييف الهواء) في عنوان الايميل (Subject)

Question 1 (10 Marks)

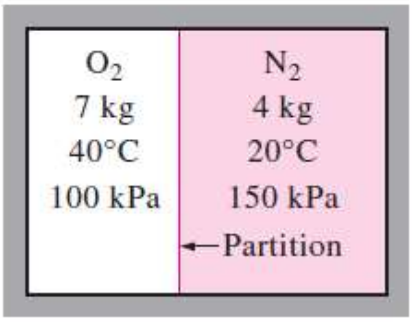
Consider a 0.8m high and 1.5m wide glass window with a thickness of 8 mm and a thermal conductivity of k = 0.78 W/m·°C. ***Determine the steady rate of heat transfer*** through this glass window and the temperature of its inner surface for a day during which the room is maintained at 20°C while the temperature of the outdoors is -10°C. Take the heat transfer coefficients on the inner and outer surfaces of the window to be h_1 = 10 W/m^2 · °C and h_2 = 40 W/m^2· °C, which includes the effects of radiation.

Question 2 (15 Marks)

Consider a gas mixture that consists of 3 kg of O_2, 5 kg of N_2, and 12 kg of CH_4. Determine (*a*) the mass fraction of each component, (*b*) the mole fraction of each component, and (*c*) the average molar mass and gas constant of the mixture.

Question 3 (15 Marks)

An insulated rigid tank is divided into two compartments by a partition, One compartment contains 7 kg of oxygen gas at 40°C and 100 kPa, and the other compartment contains 4 kg of nitrogen gas at 20°C and 150 kPa. Now the partition is removed, and the two gases are allowed to mix. Determine (*a*) the mixture temperature and (*b*) the mixture pressure after equilibrium has been established.



Question 4 (15 Marks)

Consider a room that contains air at 1 atm, 35°C, and 40 percent relative humidity. Using the psychrometric chart, determine (*a*) the specific humidity, (*b*) the enthalpy, (*c*) the wet-bulb temperature, (*d*) the dew-point temperature, and (*e*) the specific volume of the air.

Question 5 (15 Marks)

An air-conditioning system is to take in outdoor air at 10°C and 30 percent relative humidity at a steady rate of 45 m3/min and to condition it to 25°C and 60 percent relative humidity. The outdoor air is first heated to 22°C in the heating section and then humidified by the injection of hot steam in the humidifying section. Assuming the entire process takes place at a pressure of 1 atm, determine (a) the rate of heat supply in the heating section and (b) the mass flow rate of the steam required in the humidifying section.

Question 6 (15 Marks)

Saturated air leaving the cooling section of an air-conditioning system at 14°C at a rate of 50 m3/min is mixed adiabatically with the outside air at 32°C and 60 percent relative humidity at a rate of 20 m3/min. Assuming that the mixing process occurs at a pressure of 1 atm, determine the specific humidity, the relative humidity, the dry-bulb temperature, and the volume flow rate of the mixture.

Question 7 (15 Marks)

The air handling unit of an air conditioning plant supplies a total of 4500 m3/min. of dry air which comprises by weight 20% fresh air at 40oC dry bulb and 27oC wet bulb and 80% recirculated air at 25oC dry bulb and 50% relative humidity. The air leaves the cooling coil at 13oC saturated state. Calculate the total cooling load and the room heat gain.

مع أطيب أمنياتي بالتوفيق للجميع

د./عثمان حسن عثمان