Registration no: | | | | | | | | | | |

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B .TECH
PCME4402

7th Semester Regular / Back Examination 2016-17
REFRIGERATION AND AIR CONDITIONING
Branch: Mechanical
Time: 3 Hours
Max Marks: 70
Q. Code: Y344

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
(Refrigeration tables and charts are allowed in the examination hall)

Q1 **Answer the following questions:** **(2 x 10)**

a) Draw p-v and T-s plot for Bell-Coleman cycle.
b) Write down merits and demerits of air refrigeration system.
c) Explain effect of variation of discharge pressure and suction pressure on performance of refigeration system.
d) Draw the actual vapor compression cycle p-h plot citing variations from ideal cycle.
e) List out chemical requirements of ideal refrigerant.
f) Draw the schematic of Electrolaux system.
g) Mention the effects of lubricants on refrigerants.
h) What do you mean by effective temperature?
i) What do understand by adiabatic humidification?
j) What do you mean by BPF and efficiency of heating coil?

Q2 **a)** What do you understand by primary and secondary refigerants? Explain in brief. **(5)**

b) Air enters the compressor of an ideal Bryton refrigeration cycleat 1 bar and 270K with volumetric flow rate is 1.5 m^3/sec. If the compressor pressure ratio is 3 and the turbine inlet temperature is 300K. Determine (i) the net power output (ii) the refigeration capacity (iii) COP **(5)**

Q3 **a)** The pressure in the evaporator of an ammonia refrigerator is 1.902 bar and the pressure in the condenser is 12.37 bar. Calculate the refigeration effect per unit massof refrigerant and COP for the follwing cycles **(5)**

(i) The dry saturated vapor delivered to the condeser after isentropic compression and no undersooling of the condensed liquid and then throttling of refrigerant to evaporator pressure.
(ii) The dry saturated vapor delivered to the compressor and liquid after condensation is undercooled by 10°C.

b) Consider a vpor compresion system with R-12 refigerant. The maximum and minimum pressures are 8 bar and 1.2 bar respectively. At the compressor inlet the vapor temperature is -12°C and temperature at outlet of condenser outlet is 30°C. The requird refrigerant load is 2.2 kW. The compressor runs to 600 rpm and has volumtetric efficiency is 75%. Find COP and swept volume. **(5)**

Q4 **a)** In a vapor absorption refrigeration system, the refrigerant temperature is -10°C. The generator is operated by electric heater where the temperature reached is 110°C. The temperature os heat sink is 50°C. What is the maximum possible COP of the system. **(3)**

b) With neat sketches explain the NH_3+H_2O vapor absorption system. **(7)**

Q5 **a)** Describe multistage compression system with flash gas removal with neat sketch and T-s, h-s diagrams **(5)**

b) What do you understand by cascade systems? Explain with schematic layout. **(5)**

Q6 **a)** Derive the following **(4)**

$$\phi = \frac{\mu}{1-(1-\mu)\,p_s/p_b}$$

where is ϕ is relative humidity, μ is degree of saturation and p_s, p_b are saturation pressure and barometric pressure respectively.

b) Air at 28°C and 1 bar has a specific humidity of 0.016 kg per kg of dry air. Determine (i) partial pressure of water vapor (ii) relative humidity (iii) dew point temperature (iv) specific enthalpy of moist air. **(6)**

Q7 Given for a conditioned space **(10)**
RSH=20 kW, RLH=5kW
Out side conditions: 43°C DBT, 27.5°C WBT
Inside design conditions: 25°C DBT, 50% RH
BPF of the cooling coil: 0.1
The return air from the space is mixed with the outside air before enetering the cooling coil in the ratio of 4:1 by weight. Determine
(i) ADP (ii) Condition of air leaving cooling coil (iii) Dehumidified air quantity (iii) Ventilation air mass and volume flow rates (iv) Ventilation air mass and volume flow rates (iv) Total refrigeration load on the air conditioning plant.

Q8 **Write short notes (any two):** **(5X2)**

a) Winter air conditioning system
b) Themoelectric refrigeation system
c) Air washer