Total No. of Printed Pages:3

SUBJECT CODE NO:- H-182
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E. (Mechanical)
Refrigeration and Air Conditioning
(REVISED)

[Time: Three Hours] **[Max.Marks: 80]**

Please check whether you have got the right question paper.

N.B
1. Solve three questions from each section.
2. Figure to the right indicate full marks.
3. Use of refrigerant table, steam tables & psychometric chart is allowed.

Section A

Q.1 a) Explain Actual vapour compression refrigeration cycle? 06

b) Cascade refrigeration system. 07

Q.2 a) A Carnot refrigerator requires 3.5 KW per ton of refrigeration to maintain a temp. of -30^0C. 06
Determine:-
i) C.O.P of the refrigerator
ii) The temperature at which the heat is rejected
iii) The amount of heat rejected in KJ/ min.
iv) C.O.P, if the cycle is used as a heat pump.

b) A Carnot refrigeration cycle absorbs heat at 270K & rejects it at 300K. 07
i) Calculate C.O.P of cycle
ii) If the cycle is absorbing 1130 KJ/min at 270K, how many KJ of work is required per second.
iii) C.O.P, if the cycle is used as a heat pump
iv) How many KJ/ min will the heat pump deliver at 300 K if it absorbs 1130KJ/min at 270 K.

Q.3 A vapour compression system with ammonia as the refrigerant works between the pressure limits of 2 bar & 12 bar with three stage compression. The vapours leaving the water inter coolers at pressure 4 bar & 8 bar are in a saturated state. If the load is 10 TR, find the power required to drive the three compressors & compare the C.O.P of this system with that of a simple saturation cycle working between the same overall pressure limits. 13

Q.4 A simple air cooled system is used for an aero plane having a load of 10 tonnes. The atmospheric pressure & temperature are 0.9 bar & 10^0C respectively. The pressure increases to 1.013 bar due to ramming. The temperature of the air is reduced by 50^0C, in the heat exchanger. The pressure in the cabin is 1.01 bar & the temperature of air leaving the cabin is 25^0C. Determine:- 13
i) C.O.P of the system
ii) Power required to take the load of cooling in the cabin.
Assume all isentropic expansion & compression. The pressure of the compressed air is 3.5 bar.

Q.5 Write short note on the following (any three) 14

i) Boot-strap air cooling system.
ii) Methods to improve C.O.P of VCC
iii) Reduced ambient air refrigeration system
iv) Two-stage compression with liquid intercooler
v) Simple VCRS

Section B

Q.6 a) Explain simple vapour absorption system. 06

b) Explain practical vapour absorption system. 07

Q.7 a) Explain the necessity of finding alternative to CFC's. What are the better options available for CFC's? 07

b) What is refrigerant? Write down designation for following refrigerant. 06

i) Dichloro- trifluoro ethane
ii) Trichloro-trifluoro ethane
iii) Sulphur di-oxide (SO_2)
iv) Water (H_2O)

Q.8 a) The humidity ratio of atmospheric air at 28^0C dry bulb temperature & 760mm of mercury is 0.016 kg/kg of dry air determine:- 07

i) Partial press. of water vapour,
ii) Relative humidity
iii) Dew point temp,
iv) Specific enthalpy
v) Vapour density

b) Explain sensible cooling & sensible heating. 06

Q.9 A small office hall of 30 persons capacity is provided with summer air-conditioning system with the following data, 13

$Outside\ conditions = 34^0C\ DBT \& 28^0C\ WBT,$
$inside\ conditions = 24^0C\ DBT\ \&\ 50\%$ Relative humidity
Volume of air supplied = 0.4 m^3/min/ person
Sensible heat load in room = 125600 KJ/hr.
Latent heat load in room = 42000 KJ/hr.
Find the sensible heat factor of the plant.

Q.10 Write short note on (any three) 14

i) Steam jet refrigeration
ii) Human comfort
iii) Summer air-conditioning system
iv) ICE plant
v) GWP & ODP