A

SHRI RAMSWAROOP MEMORIAL COLLEGE OF ENGG. & MANAGEMENT

B.Tech. [SEM VI (ME-61, 62, 63 & 64)]

QUIZ TEST-1

(Session: 2012-13)

Time: 1 Hour **REFREGERATION AND AIRCONDITIONING (EME-604)** *Max. Marks: 30*

Roll No.

(To be filled by the Student)

Note: Attempt All Questions.

Part – A

(Questions from Tutorial Sheet)

[10 Marks]

Q1) A refrigerator working on Bell-Coleman cycle (Reverse Brayton cycle) operates between 1 bar and 10 bar. Air is drawn from cold chamber at -10ºC. Air coming out of compressor is cooled to 50ºC before entering the expansion cylinder. Polytropic law $P.V^{1.3}$ = constant is followed during expansion and compression. Find theoretical C.O.P of the origin. Take γ= 1.4and C_p = 1.00 kJ/kg ^{0}C for air. *(Question-1)* **[5]**

Q2) A regenerative air cooling system is used for an air plane to take 20 tonne of refrigeration load. The ambient air at pressure 0.85 bar and temp 5^0C is rammed isentropic ally till the pressure rises to 1.2 bar. The air bled off the main compressor at 4.8 bars is cooled by the ram air in the heat exchanger whose effectiveness is 60% the air from the heat exchanger is further cooled to 50^0 C in the regenerative heat exchanger with a portion of air bled after expansion From cooling turbine. The cabin is to be maintained at a temperature of 25^0 C and a pressure of 1 bar. If the isentropic efficiencies of the compressor and turbine are 90% and 80% respectively, determine the following-

(a) The ratio of bypassed air to ram air used for cooling purposes;

(b) Power required for maintaining the cabin at the required condition.

Assuming isentropic ramming and mass of cooled air passing through the heat exchanger equal to the mass of cooling air.

(Question-12) **[3+2]**

Part – B

[20 Marks]

Q1)Describe the operation of regenerative Boot strap air cycle system for aircraft cooling with the help of its block diagram and T-S diagram. [3+2+2]

Q.2)(a) What do you understand by refrigeration by expansion of air. Explain with suitable cycle. [2+2]

(b)Find the COP of reverse Carnot cycle. [3]

Q.3)An ice plant produces 12 tons of ice per day at 0 ^{0}C using water at 30^0C.The plant operates on reversed carnot cycle between -15^0C and 28^0C.If the actual COP is 50% of the ideal COP and the overall electromechanical efficiency is 0.8,estimate the power rating of compressor motor.Latent heat of ice is335KJ/Kg,specific heat of water is 4.18KJ/KgK [6]

X

B

SHRI RAMSWAROOP MEMORIAL COLLEGE OF ENGG. & MANAGEMENT

B.Tech. [SEM VI (ME-61, 62, 63 & 64)]

QUIZ TEST-1

(Session: 2012-13)

Time: 1 Hour **REFREGERATION AND AIRCONDITIONING (EME-604)** *Max. Marks: 30*

Roll No.

(To be filled by the Student)

Note: Attempt All Questions.

Part – A

(Questions from Tutorial Sheet)

[10 Marks]

Q1) An air refrigerator working on the principle of Bell-Coleman cycle. The air into the compressor is at 1 atm at -10ºC. It is compressed to 10 atm and cooled to 40ºC at the same pressure. It is then expanded to 1 atm and discharged to take cooling load. The air circulation is 1 kg/s.

The isentropic efficiency of the compressor = 80%

The isentropic efficiency of the expander = 90%

Find the following:

i) Refrigeration capacity of the system

ii) C.O.P of the system

Take $\gamma = 1.4$, $C_p = 1.00$ kJ/kg ºC *(Question-2)* **[3+2]**

Q2) An air refrigerator used for food storage provides 50TR. The temp of air entering the compressor is 7^0C and the temp before entering into the expander is 27^0C. Assuming a 70% mechanical efficiency, find:

(a) Actual C.O.P (b) Power required running the compressor.

The quantity of air circulated in the system is 100Kg/min. The compression and expansion follow the law $pv^{1.3}$ = constant.

Take $\gamma = 1.4$; $C_p = 1$Kj/Kg K for air. *(Question-16)* **[3+2]**

Part – B

[20 Marks]

Q1)Describe the operation of regenerative Boot strap air cycle system for aircraft cooling with the help of its block diagram and T-S diagram. [3+2+2]

Q.2)(a) What do you understand by refrigeration by expansion of air. Explain with suitable cycle. [2+2]

(b)Find the COP of reverse Carnot cycle. [3]

Q.3)An ice plant produces 12 tons of ice per day at 0 ^{0}C using water at 30^0C.The plant operates on reversed carnot cycle between -15^0C and 28^0C.If the actual COP is 50% of the ideal COP and the overall electromechanical efficiency is 0.8,estimate the power rating of compressor motor.Latent heat of ice is335KJ/Kg,specific heat of water is 4.18KJ/KgK [6]

X

C

SHRI RAMSWAROOP MEMORIAL COLLEGE OF ENGG. & MANAGEMENT

B.Tech. [SEM VI (ME-61, 62, 63 & 64)]

QUIZ TEST-1

(Session: 2012-13)

Time: 1 Hour **REFREGERATION AND AIRCONDITIONING (EME-604)** ***Max. Marks: 30***

Roll No.

(To be filled by the Student)

Note: Attempt All Questions.

Part – A

(Questions from Tutorial Sheet)

[10 Marks]

Q1) A cold storage plant is required to store 50 tons of fish. The temperature at which fish was supplied = 35°C Storage temperature of fish = -10°C ,C_p of fish above freezing point = 2.94kJ/kg°C ,C_p of fish below freezing point = 1.26 kJ/kg°C ,Freezing point of fish = -5°C ,Latent heat of fish = 250 kJ/kg .If the cooling is achieved within half of a day, find:

a) Capacity of the refrigerating plant
b) Carnot COP
c) If actual COP = Carnot COP/2.5 find the power required to run the plant. *(Q.3)* **[3+1+1]**

Q2) The cock pit of a jet plane flying at a speed of 1200Km/hr is to be cooled by a simple Air cooling system. The cockpit is to be maintained at25^0C and the pressure in the cockpit Is 1 bar.The other available data is as follows;

Cockpit cooling load=10TR
Ambient air pressure & temp = 0.85 bar, 30^0 C
Ram efficiency = 90%
Pressure ratio in the main compressor =4
Pressure drop in the heat exchanger = 0.5bar
Isentropic efficiency of main compressor is 75%and cooling turbine is 80%
Temp of air entering the cooling turbine = 60^0 C
Pressure loss between the cooler turbine and cockpit=0.2 bar.
Find-(a) the quantity of air passed through the cooling turbine.
(b) C.O.P of the system.
Take γ =1.4 and Cp=1kj/Kg K

.

(Question-9) **[3+2]**

C

Part – B

[20 Marks]

Q1)Describe the operation of regenerative Boot strap air cycle system for aircraft cooling with the help of its block diagram and T-S diagram. [3+2+2]

Q.2)(a) What do you understand by refrigeration by expansion of air. Explain with suitable cycle. [2+2]
(b)Find the COP of reverse Carnot cycle. [3]

Q.3)An ice plant produces 12 tons of ice per day at 0 ^{0}C using water at 30^{0}C.The plant operates on reversed carnot cycle between -15^{0}C and 28^{0}C.If the actual COP is 50% of the ideal COP and the overall electromechanical efficiency is 0.8,estimate the power rating of compressor motor.Latent heat of ice is335KJ/Kg,specific heat of water is 4.18KJ/KgK [6]

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D

SHRI RAMSWAROOP MEMORIAL COLLEGE OF ENGG. & MANAGEMENT

B.Tech. [SEM VI (ME-61, 62, 63 & 64)]

QUIZ TEST-1

(Session: 2012-13)

Time: 1 Hour **REFREGERATION AND AIRCONDITIONING (EME-604)** *Max. Marks: 30*

Roll No.

(To be filled by the Student)

Note: Attempt All Questions.

Part – A

(Questions from Tutorial Sheet)

[10 Marks]

Q1) A simple air cooled system is used for an aeroplane to take a load of 10 tons. Atmospheric temperature and pressure is 25°C and 0.9 atm respectively. Due to ramming the pressure of air is increased from 0.9 atm, to 1 atm. The pressure of air leaving the main compressor is 3.5 atm and its 50% heat is removed in the air-cooled heat exchanger and then it is passed through a evaporator for future cooling. The temperature of air is reduced by 10°C in the evaporator. Lastly the air is passed through cooling turbine and is supplied to the cooling cabin where the pressure is 1.03 atm. Assuming isentropic efficiency of the compressor and turbine are 75% and 70%, find

a) Power required to take the load in the cooling cabin
b) COP of the system.

The temperature of air leaving the cabin should not exceed 25°C. ***(Q.4)*** **[3+2]**

Q2) A dense Bell Coleman gas refrigeration cycle is working between the pressure limits of 3.4 bar and 17 bar. Temperature of air after the cooler is 15^0C and 17 bar and after refrigerator is 6^0C . For a refrigeration capacity of 6 tons, find;

(a)Temp after compression and expansion,
(b)Air circulation required in the cycle per min,
(c)Work of compressor and expander,
(d)Theoretical C.O.P
(e)Rate of water circulation required in the cooler in Kg/min, if the rise in temp is limited to 30^0C. ***(Q.-14)*** **[1+1+1+1+1]**

Part – B

[20 Marks]

Q1)Describe the operation of regenerative Boot strap air cycle system for aircraft cooling with the help of its block diagram and T-S diagram. [3+2+2]

Q.2)(a) What do you understand by refrigeration by expansion of air. Explain with suitable cycle. [2+2]
(b)Find the COP of reverse Carnot cycle. [3]

Q.3) An ice plant produces 12 tons of ice per day at 0 ^{0}C using water at 30^0C.The plant operates on reversed Carnot cycle between -15^0C and 28^0C.If the actual COP is 50% of the ideal COP and the overall electromechanical efficiency is 0.8, estimate the power rating of compressor motor. Latent heat of ice is335KJ/Kg,specific heat of water is 4.18KJ/KgK [6]

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E

Academic/26
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SHRI RAMSWAROOP MEMORIAL COLLEGE OF ENGG. & MANAGEMENT

B.Tech. [SEM VI (ME-61, 62, 63 & 64)]

QUIZ TEST-1

(Session: 2012-13)

Time: 1 Hour **REFREGERATION AND AIRCONDITIONING (EME-604)** *Max. Marks: 30*

Roll No.

(To be filled by the Student)

Note: Attempt All Questions.

Part – A

(Questions from Tutorial Sheet)

[10 Marks]

Q1) An air refrigerator working on bell Coleman cycle takes into the compressor at 1bar and 268^0 k. It is compressed in the compressor to 5 bar and cooled to 298^0k at the same pressure. It is further expanded in the expander to 1 bar and discharged to take the cooling load. The isentropic efficiencies of the compressor and expander are 85% and 90% respectively. Determine- i) refrigeration capacity of the system if the air circulated is 40Kg/min.

ii) Power required for the compressor

iii) COP of the system.

Take γ=1.4, Cp=1Kj/Kg^{0}C and Cv=0.7Kj/Kg^{0}C for air

(Question-6) **[3+2]**

Q2) A simple air refrigeration system is used for an aircraft to take a load of 20TR. The ambient pressure and temperature are 0.9 bar and 22^0 C respectively. The pressure of air is increased to 1 bar due to ramming action. The air is further compressed in a compressor to 3.5 bars and then cooled in a heat exchanger to 72^0 C. Finally the air is passed through the cooling turbine and then it is supplied to the cabin at a pressure of 1.05 bars. The air leaves the cabin at a temperature of 25^0 C. assuming the isentropic efficiencies of the compressor and turbine as 80% and 75% respectively. Find- i) Power required taking the load in the cooling cabin

ii) C.O.P of the system

Take cp=1.005 kj/kg^0 k, and γ=1.4 *(Question-8)* **[3+2]**

Part – B

[20 Marks]

Q1)Describe the operation of regenerative Boot strap air cycle system for aircraft cooling with the help of its block diagram and T-S diagram. [3+2+2]

Q.2)(a) What do you understand by refrigeration by expansion of air. Explain with suitable cycle. [2+2]

(b)Find the COP of reverse Carnot cycle. [3]

Q.3) An ice plant produces 12 tons of ice per day at 0 ^{0}C using water at 30^0C.The plant operates on reversed Carnot cycle between -15^0C and 28^0C.If the actual COP is 50% of the ideal COP and the overall electromechanical efficiency is 0.8,estimate the power rating of compressor motor. Latent heat of ice is335KJ/Kg,specific heat of water is 4.18KJ/KgK [6]

X

A

SHRI RAMSWAROOP MEMORIAL COLLEGE OF ENGG. & MANAGEMENT

B.Tech. [SEM VI (ME-61, 62, 63 & 64)]

QUIZ TEST-2

(Session: 2012-13)

Time: 1 Hour **REFRIGERATION AND AIRCONDITIONING (EME-604)** *Max. Marks: 30*

Roll No.

(To be filled by the Student)

Note: Attempt All Questions.

Part – A

(Questions from Tutorial Sheet)

[10 Marks]

Q1) The operating temperatures of a single stage vapour absorption refrigeration system are: generator: **90 ^{o}C**; condenser and absorber: **40 ^{o}C**; evaporator: **0 ^{o}C**. The system has a refrigeration capacity of **100 kW** and the heat input to the system is **160 kW**. The solution pump work is negligible.

a) Find the COP of the system and the total heat rejection rate from the system.

b) An inventor claims that by improving the design of all the components of the system he could reduce the heat input to the system to **80 kW** while keeping the refrigeration capacity and operating temperatures same as before. Examine the validity of the claim. *(Question-1)***[2+3]**

Q2) The following data refer to a LiBr+H_2O absorption system: Generator temp.=80^0C,Condenser temp=absorber temp.=30^0C;Evaporator temp=10^0C; condensate temp.=25^0C.Steam enters the generator heating coil at 120^0C and leaves it at 100^0C as condensate. The concentration of liquid leaving the generator is 0.65 and its enthalpy is -75kJ/kg.The concentration of liquid leaving the absorber is 0.51 and its enthalpy is -170kJ/kg. The enthalpy of vapor leaving the generator is 2620kJ/kg. The flow rate through the evaporator is 0.4 kg/s.

Find the :

(a) Pressure in generator, condenser, evaporator and absorber in mm of mercury head.

(b)Tonnage

(c) Heat rejection to condenser and absorber *(Question-10)* **[1+2+2]**

Part – B

[20 Marks]

Q1) (a)Derive an expression for the cop of an ideal vapour absorption system in terms of the Generator, Evaporator,Condenser and Absorber temperatures. [3]

(b)Explain the working of practical NH_3-H_2O vapour absorption refrigeration system with neat sketch. **[5]**

Q2) Find the ratio of mass of the adiabatic mixing of two streams as related to vapour-absorption refrigeration system. **[5]**

Q3)(a) Explain the concept of enthalpy-concentration diagram. **[4]**

(b) In a vapour absorption refrigeration system the refrigeration temperature is -15^0C.The generator is operated by solar heat where the temperature reached is 110^0C.The temperature of the heat sink is 55^0C.What is the maxium possible COP of the system. **[3]**

_____X_____

B

SHRI RAMSWAROOP MEMORIAL COLLEGE OF ENGG. & MANAGEMENT

B.Tech. [SEM VI (ME-61, 62, 63 & 64)]

QUIZ TEST-2

(Session: 2012-13)

Time: 1 Hour **REFRIGERATION AND AIRCONDITIONING (EME-604)** *Max. Marks: 30*

Roll No.

(To be filled by the Student)

Note: Attempt All Questions.

Part – A

(Questions from Tutorial Sheet)

[10 Marks]

Q1) A 20 tons refrigerating load on an evaporator is taken by an ammonia absorption refrigeration machine. The cooling is carried out at -30 ^{0}C.The refrigerant coming out of the condenser is at 20^{0}C and it leaves the evaporator at saturated condition. Assume the following data:Pressure in the generator=11 bar, temperature of strong aqua=70^{0}C ,Temperature of weak aqua=100^{0}C ,Heat of one kg of anhydras NH_3 leaving the generator=1930kj/kg, concentration of the weak aqua=0.28, concentration of the strong aqua=0.34,mean specific heat of aqua solution=4.7kJ/kg-^{0}C .Take the heat of aqua per kg at 0^{0}C =418kj/kg. Heat of absorption is given by Q_a=806-588x_w-5960 x_w Find the quantity of steam required per hour for heating the strong aqua solution in generator if the steam is supplied at 5 bar and 0.9 dry and condensate comes out at 130^{0}C *(Question-4)* **[5]**

Q2) In an absorption type refrigerator, the heat is supplied to NH_3 generator by condensing steam at 2 bar and 90%.The temperature to be maintained in the refrigerator is – 5^{0}C. The temperature of the atmosphere is 30^{0}C.Find the maximum C.O.P. possible of the refrigerator.
If the refrigerator load is 20 tons and actual C.O.P. is 70% of maximum C.O.P. Find the mass of steam required per hour.
(Question-6) **[2+3]**

Part – B

[20 Marks]

Q1) (a)Derive an expression for the cop of an ideal vapour absorption system in terms of the Generator, Evaporator,Condenser and Absorber temperatures. [3]
(b)Explain the working of practical NH_3-H_2O vapour absorption refrigeration system with neat sketch. **[5]**

Q2) Find the ratio of mass of the adiabatic mixing of two streams as related to vapour-absorption refrigeration system. **[5]**

Q3)(a) Explain the concept of enthalpy-concentration diagram. **[4]**
(b) In a vapour absorption refrigeration system the refrigeration temperature is -15^{0}C.The generator is operated by solar heat where the temperature reached is 110^{0}C.The temperature of the heat sink is 55^{0}C.What is the maxium possible COP of the system. **[3]**

_____X_____

C

SHRI RAMSWAROOP MEMORIAL COLLEGE OF ENGG. & MANAGEMENT

B.Tech. [SEM VI (ME-61, 62, 63 & 64)]

QUIZ TEST-2

(Session: 2012-13)

Time: 1 Hour **REFRIGERATION AND AIRCONDITIONING (EME-604)** ***Max. Marks: 30***

Roll No.

(To be filled by the Student)

Note: Attempt All Questions.

Part – A

(Questions from Tutorial Sheet)

[10 Marks]

Q1) A stream of 15 kg/sec of aqua ammonia (C_1=0.8) at 0^0C and 5 bar mixes adiabatically with another saturated liquid stream with the flow rate 10kg/sec and100^0C at the same pressure. Establish the state points on h-c diagram and obtain (a) Mixture concentration (b) Mixture enthalpy(c) amount of liquid and vapour after mixing. *(Question-3)* **[2+2+1]**

Q2) In an absorption refrigeration system, the generator condenser and evaporator temperatures are 110^0C,3^0C and -10^0C respectively. Find the ideal COP of the system. Find the change in the COP in the following cases (a) Generator temperature increases by 30^0C (b) condenser temp. decreases by 8^0C (c) Evaporator temp. rises by 10^0C.*(Question-13)* **[2+1+1+1]**

Part – B

[20 Marks]

Q1) (a)Derive an expression for the cop of an ideal vapour absorption system in terms of the Generator, Evaporator,Condenser and Absorber temperatures. [3]

(b)Explain the working of practical NH_3-H_2O vapour absorption refrigeration system with neat sketch. **[5]**

Q2) Find the ratio of mass of the adiabatic mixing of two streams as related to vapour-absorption refrigeration system. **[5]**

Q3)(a) Explain the concept of enthalpy-concentration diagram. **[4]**

(b) In a vapour absorption refrigeration system the refrigeration temperature is -15^0C.The generator is operated by solar heat where the temperature reached is 110^0C.The temperature of the heat sink is 55^0C.What is the maxium possible COP of the system. **[3]**

_____X_____

D

SHRI RAMSWAROOP MEMORIAL COLLEGE OF ENGG. & MANAGEMENT

B.Tech. [SEM VI (ME-61, 62, 63 & 64)]

QUIZ TEST-2

(Session: 2012-13)

Time: 1 Hour **REFRIGERATION AND AIRCONDITIONING (EME-604)** *Max. Marks: 30*

Roll No.

(To be filled by the Student)

Note: Attempt All Questions.

Part – A

(Questions from Tutorial Sheet)

[10 Marks]

Q1) In an NH3 absorption type refrigerator system, the strong ammonia solution at 85^0C is supplied to the generator at the rate of 8 kg/min. The pressure maintained in the generator is 12 bar. The rate of evaporation (dry- NH_3-vopur) from the generator is 1.5 kg/min. The enthalpy of NH_3 vapour coming out of the generator is 1880kj/kg. The remaining weak solution leaves the generator at 105 ^{0}C. Find the quantity of the heat supplied per kg of NH_3 vapour generated. Assume the specific heat of the solution is 4.94 kJ/kg-^{0}C and mean mass concentration is 0.35.The NH_3 is reduced to liquid at 30^0C before entering the evaporator and evaporated at 2 bar. Find the refrigeration effect and C.O.P.
Also compare the refrigerating effect with that obtained by vapour compression system working between same pressure limit. Assume compression is isentropic, suction is dried and saturated and there is no sub cooling. Thermal efficiency is 20%. *(Question-7)* **[5]**

Q2) 7 kg of liquid aqua ammonia with a concentration 0.7kg of NH_3 per kg mixture at 15^0C and 7 bar is adiabatically mixed with 0.5 kg saturated liquid aqua ammonia at 100^0C and 7 bar. Assuming steady flow condition determine (a) The mixture concentration (b) The mixture enthalpy (c) The equilibrium temperature of mixture (d) Percentage of vapour and liquid in the mixture after equilibrium has been reached.
(Question-11) **[2+1+1+1]**

Part – B

[20 Marks]

Q1) (a)Derive an expression for the cop of an ideal vapour absorption system in terms of the Generator, Evaporator,Condenser and Absorber temperatures. [3]
(b)Explain the working of practical NH_3-H_2O vapour absorption refrigeration system with neat sketch. **[5]**

Q2) Find the ratio of mass of the adiabatic mixing of two streams as related to vapour-absorption refrigeration system. **[5]**

Q3)(a) Explain the concept of enthalpy-concentration diagram. **[4]**
(b) In a vapour absorption refrigeration system the refrigeration temperature is -15^0C.The generator is operated by solar heat where the temperature reached is 110^0C.The temperature of the heat sink is 55^0C.What is the maxium possible COP of the system. **[3]**

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B.Tech. [SEM VI (ME-61, 62, 63 & 64)]

QUIZ TEST-2

(Session: 2012-13)

Time: 1 Hour **REFRIGERATION AND AIRCONDITIONING (EME-604)** *Max. Marks: 30*

Roll No.

(To be filled by the Student)

Note: Attempt All Questions.

Part – A

(Questions from Tutorial Sheet)

[10 Marks]

Q1) In an aqua-ammonia absorption refrigeration system of 10TR capacity, the vapours leaving the generator are 100% pure NH_3 saturated at 40 ^{0}C.The evaporator, absorber, condenser and generator temp. are -20^{0}C,30^{0}C,40^{0}C and 70^{0}C respectively. At absorber exit(strong solution),the concentration of ammonia in solution is x=0.38 and enthalpy h=22kJ/kg. At generator exit(weak solution) x=0.1 and h=695 kJ/kg.
(a)Determine mass flow rate of ammonia in the evaporator.
(b) Carry out overall mass conservation and mass conservation of ammonia in absorber to determine mass flow rates of weak and strong solutions. *(Question-8)* **[2+3]**

Q2) The total pressure maintained in an Electrolux refrigerator is 14.71 bar. The temp. obtained in the evaporator is -15^{0}C.The quantities of heat supplied in the generator are 418.7kJ to dissociate 1 kg of vapor and 1465.4kJ/kg for increasing the total enthalpy of NH_3.The enthalpy of NH_3 entering the evaporator is 335kj/kg. Take the following properties of NH_3 at -15^{0}C: pressure=2.45 bar; Enthalpy of NH_3 vapor =1666kj/kg; specific volume=0.5 m^3/kg
The hydrogen enters the evaporator at 25^{0}C.gas constant for H_2=4.218kJ/kgK;C_p=12.7 kJ/kgK.
Find the COP of the system. Assume NH_3 leaves the evaporator in saturated condition.
(Question-9) **[5]**

Part – B

[20 Marks]

Q1) (a)Derive an expression for the cop of an ideal vapour absorption system in terms of the Generator, Evaporator,Condenser and Absorber temperatures. [3]
(b)Explain the working of practical NH_3-H_2O vapour absorption refrigeration system with neat sketch. **[5]**

Q2) Find the ratio of mass of the adiabatic mixing of two streams as related to vapour-absorption refrigeration system. **[5]**

Q3)(a) Explain the concept of enthalpy-concentration diagram. **[4]**
(b) In a vapour absorption refrigeration system the refrigeration temperature is -15^{0}C.The generator is operated by solar heat where the temperature reached is 110^{0}C.The temperature of the heat sink is 55^{0}C.What is the maxium possible COP of the system. **[3]**

_____X_____