DEPARTMENT OF MECHANICAL ENGINEERING
QUESTION BANK

UNIT NO.:-01 - (Fundamentals and Applications of Refrigeration and Air Conditioning)

SUBJECT: REFRIGERATION & AIR CONDITIONING   COURSE : TE (2015 Pattern)

THEORY QUESTIONS

1   Define 'one tonne refrigeration

2   What is refrigeration? Enumerate the different method used for refrigeration.

3   Explain the concept of DART

4   Write a note on 'thermoelectric refrigeration

5   write a short note on Automobile air conditioning system.

6   Write a note on 'steam jet refrigeration

7   How the refrigerants are classfied? What are the essentials properties of a good refrigerant?

8   Discuss the necessity of phasing out of CFC refrigerants. List the alternative refrigerants

9   Explain the following terms   I)
    Ozone Depletion Potential II) Global Warming Potential   III) TEWI

10 Describe briefly ODP and selection of environment friendly refrigerant

11 Write note on "Refrigerant Recovery, Recycling and Reclaiming.

12 Discuss, in detail, the secondary refrigerants

13 Write a note on Montreal protocol and kyoto protocol.

14 Give alternate refrigerants for CFC's and HCFC's with justification

15 What is the concept of green building.

16 Explain reversed carnot cycle used for refrigeration with the help of P-V and T-S diagram.

17 Give the lay-out of an ice plant and explain briefly how ice is manufactured?

18 With schematic diagram explain the working of evaporative cooler.

19 Explain the air conditioning plant for multiplex with respect to thefollowing's:

20 Compare evaporative cooler with air conditioner.

DEPARTMENT OF MECHANICAL ENGINEERING
QUESTION BANK
UNIT NO. 2 -Vapour Compression Cycle & VAS.

SUBJECT: REFRIGERATION & AIR CONDITIONING   COURSE : TE (2015 Pattern)

THEORY QUESTIONS

1   Discuss why refrigerants are so selected that evaporator pressures and condenser pressures are greater than atmospheric pressure?

2   Explain reversed carnot cycle used for refrigeration with the help of P-V and T-S diagram. Derive an expression for COP. What are the limitations of reversed Carnot cycle.

3   Discuss the effect of operating parameters on performance of VCR Cycle

4   Explain Electrolux system with a neat sketch

5   Explain lithium bromide absorption system.

6   Compare : VAR and VCR.

7   Define EER, SEER,IPLV &NPLV

8   What is subcooling ?explain the effect of subcooling of condensate with the help of T-s and P-h diagram in VCC.

9   What is the function of the following components in anvapor absorption refrigeration system. i) Absorber ii) Rectifier iii) Analyzer iii) Heat Exchangers

10 What is selection criteria of refrigerant absorbent mixture

11 Mension the function of each fluid in a three fluid vapour absorption system.

12 Compare : VAR and VCR.

13 Discuss the effect of operating parameters on performance of VCR Cycle

NUMERICALS

Q.13 A domestic refrigerator used R134-a refrigerant and runs on VCC to keep inside temperature at -10°C by rejecting heat to an environment at 50°C. The heat leakage from the environment is estimated to be 1200kj/h and the vapor is super-heated before compression by 4°C outside the evaporator.Determine
i) the rate of heat rejection in condenser in kj/h,
ii) the COP of the refrigerator.
iii) power input to compressor and
iv) volume displacement of compressor

Q.14 A 2TR air conditioner based on simple saturated vapor compression cycle operates between 12°Cand 50°C. Determine
i) COP
ii) Power per ton of refrigeration
iii) Mass circulation of refrigerant in kg/h
iv) Dryness fraction after throttling

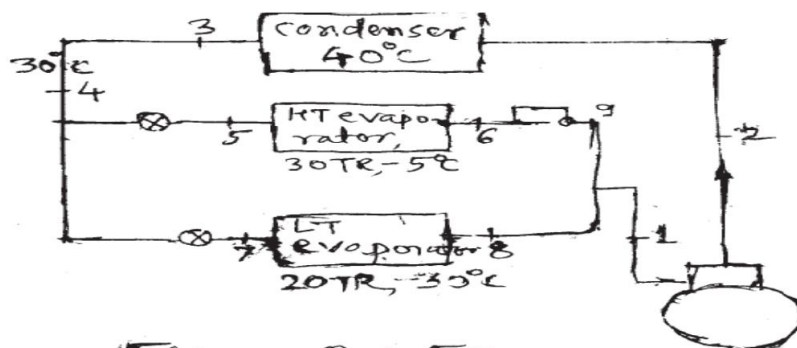## THEORY QUESTIONS

Q.1 Mention with the help of p-h charts various combination of evaporators and compressors in vapor compression system

Q.2 Draw and explain in detail actual vapour abosorption cycle

Q.3 What is the necessity of multi-staging? Explain Cascade system with thehelp of a sketch and P-h diagram

Q.4 Explain two stage compression with flash gas removal

Q.5 Explain analysis of a refrigeration system having three evaporators atdifferent temperatures with compound compression, individual expansion valves and flash intercoolers. using schematic dia. & P-h dia

Q.6 What are the different methods used for intercooling the refrigerantvapours in multistage compression?

Q.7

Q.8 Define cryogenics with their applications

Q.9 What are the different methods used for intercooling the refrigerant vapours in multistage compression?

Q.10 Explain Linde-Hampson cycle

Q.13 Explain cascade system with a neat sketch and p-h diagram

Q.14 Mention the advantages of Cascade refrigeration system over two stage vapour compression refrigeration system.

NUMERICALS

Q.9 A data pertaining to refrigeration system is as follows: Two separate evaporators E1 (5 TR) and E2 {1OTR) at temperatures5°C and 15°C respectively. Common condenser is at a temperature38C.The liquid from the condenser is saturated. After evaporator E2, pressurereducing valve bring the pressure to the suction pressure of thecompressor. Single compressor and individual expansion valves are usedin the system. Use Refrigerant data provided. Make the neat flow diagramand a cycle diagram on P-h plane, Find;
i) Power required to run the systemii) COP of the System

Q.10 A typical multipressure system is shown in the Figure. The refrigerant R-134a is used in the cycle. Sketch the cycle on P-h diagram and calculate: i) Overall COP ii) Mass flow refrigerant through each evaporator. iii) Cooling load on condenser assuming that subcooling takes place in condenser.

Figure Que 5a

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UNIT NO. 4 -Psychrometry and Air-conditioning
SUBJECT: REFRIGERATION & AIR CONDITIONING   COURSE : TE (2015 Pattern)

THEORY QUESTIONS

Q.1 Compare: Unitary air conditioning and central air conditioning   6

Q.2 How will you define air conditioning system as against refrigeration system.   6

Q.3 Classify air conditioning systems and explain with sketch any one system you have classified.   4

Q.4 Explain   the   following   with   hand   drawn   psychometric   chart   6
     I) ADP   II) RSHF   III) ERSHF   IV) GSHF

Q.5 Define the following terms :   6
     i) DBT,   ii) WBT,   iii) DPT,   iv) Specific humidity
     v) Degree of saturation,   vi) Relative Humidity,
     vii) Bypass factor of coil and   viii) Psychrometry

Q.6 Derive expression for specific humidity and show that it is a function of vapour pressure and   4
     barometric pressure of air

Q.7 Write short notes on i) Transform refrigeration.ii) In-filtration and ventilation load in air   4
     conditioning.

Q.8 Define and explain the following: [8]
     i) Humidity ratio
     ii) Dew point temperature
     iii) Relative humidity
     iv) Wet bulb temperature

Q.9 Explain the various industrial applications of air-conditioning   4

NUMERICALS

Q.10 Two kg of air at 40°C DBT and 50% RH is mixed with 3 kg of air at 20°C DBT and 100% RH.   7
      Calculate the resultant condition of the air after mixing

Q.11 Moist air at the state of 21°C DBT , 15°CWBT and 101.32 kPa barometric pressure enters a   7
      spray chamber. If for each kg of dry air passing through the chamber 0.002 kg of water at 100
      °Cis injected and totally evaporated, calculate the moisture content , enthalpy and DBT of the
      moist air leaving the chamber.

Q.12 1.5 m3/s of moist air at a state of 28°C dry-bulb, 21°C wet-bulb and 101.325 kPa flows across   8
      a cooler coil and leaves the coil at 13°C dry- bulb and specific humidity of 8.5 gm per kg of dry
      air. Determine the apparatus dew point, the contact factor and the cooling load.

Q.13 Moist air at standard atmospheric pressure is passed over a cooling coil. The inlet state - DBT   12
      30°C, RH 50% and exit state - DBT 15°C, RH 90%. Show the process on psychrometric chart.
      Determine the amount of heat and moisture removed per kg of dry air.

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UNIT NO.5 - Air Conditioning Systems

SUBJECT: REFRIGERATION & AIR CONDITIONING   **COURSE : TE (2015 Pattern)**

THEORY QUESTIONS

Q.1 Write short notes on: "Operating and Safety controls in refrigeration system"   4

Q.2 Enumerate the basic elements of the control system. Explain   6

Q.3 Explain with neat sketch the working of thermostatic expansion value. Where it is used?   4

Q.4 What different types of evaporators are used in refrigeration systems? Explain with neat sketches.   4

Q.5 Explain briefly the following types of reciprocating compressor   6
1. Open type vertical reciprocating compressor
2. Semi sealed types
3. Hermetically sealed type

Q.6 Give the main types of condenser in use, with specific application of each types   6

Q.7 State the factors which should be taken into consideration while selecting a system of air-conditioning.

Q.8 Explain briefly the following control devices:
i) Thermostats
ii) Automatic humidity control
iii) Air movement control
iv) Automatic temperature control

Q.9 Explain with neat sketches the following evaporators
1. Flooded type evaporator
2. Dry expansion evaporator

Q.10 Classify the air conditioning systems. Compare all air-air conditioning system with all water-air conditioning system

Q.11 With neat diagram explain the working of single screw compressor. What are the advantages of it over reciprocating compressor?

Q.12 With neat schematic explain the variable air volume air conditioning system. What are the advantages over constant volume system?

Q.13 Draw the constructional diagram for TXV and explain its working. What are the limitations TXV?

DEPARTMENT OF MECHANICAL ENGINEERING
QUESTION BANK
UNIT NO. 06 - Air Distribution Systems
#### SUBJECT: REFRIGERATION & AIR CONDITIONING   COURSE : TE (2015 Pattern)

THEORY QUESTIONS

Q.1 Define following as applied to air distribution Inlet, outlet, grille, register, diffuser, throw, drop   6
and primary air.

Q.2 What is a 'duct' in air - conditioning? How will you classify the ducts?Explain.   4

Q.3 Describe the different materials used for duct. Classify duct   4

Q.4 What different methods are used for determining the duct sizes? Mention the advantages of   6
each.

Q.5 Explain any two of the following air distribution system   6
1. Ejector system
2. Downward system
3. Upward system

Q.6 What is objective of duct design? Explain static regain method of duct design giving
advantages & disadvantages.

Q.7 Briefly Explain the equal friction loss method of duct design giving its advantages

Q.8 Derive equation for the equivalent circular diameter of a rectangular duct. Take a and b are
longer and shorter sides of a rectangular duct.

NUMERICALS

Q.9 Find the sizes of various circular in the system as shown in fig(3). Determine the power   10
required to drive the blower. The velocity in AB should not exceed 420 m/min. Use equal
friction loss method.
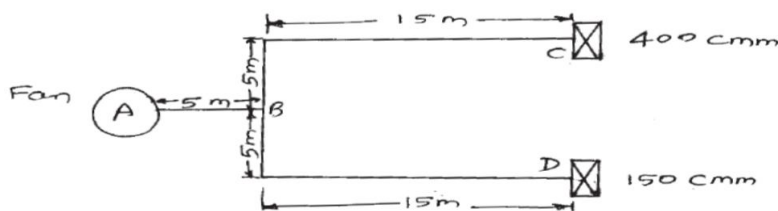
Q.10 The main supply air duct of an air - conditioning system is 100cm X 90 cm in cross section and   10
carries 10m3/s of air. It branches off into two ducts, one 80cm X 80cm and the other 80 cm X
60 cm, if the mean velocity in the larger branch is 9m/s, find the mean velocities in the main
duct and smaller branch.

Q.11 A 600 mm x 400 mm size duct carries 90 cmm of air having density of 1.2 kg/m3. Determine   10
the equivalent diameter of the circular duct:i) If the quantity of air carried in both the cases is
same.
ii) If the velocity of air in both the cases is the same.
If friction factor, f = 0.011, find the pressure loss per 100 m length of duct. Find air power
required.

Q.12 Determine the duct sizes of the duct system as shown in Fig.1 using equal friction method. 10
Determine the FTP and dampering required at each branch. Assume the velocity in main duct A
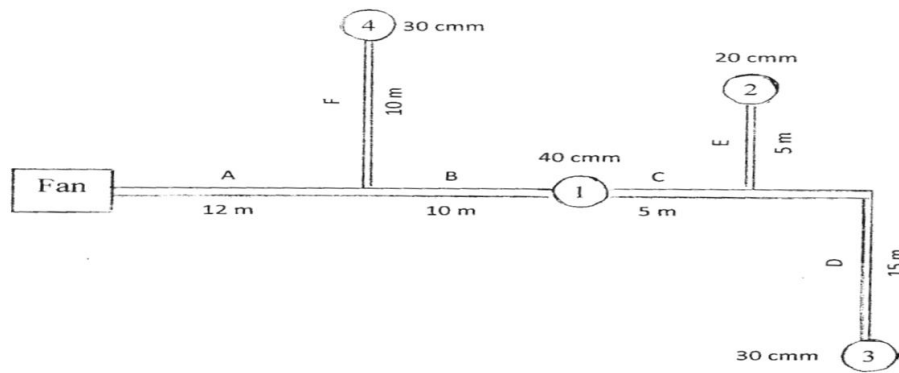as 300 mpm. Also dynamic loss coefficient in elbow k=0.22. Use static regain factor R=0.75.

10

Fig. 1 - for Q. 9 b)