R15

Code No: 126ZM

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, December - 2018
REFRIGERATION AND AIR CONDITIONING
(Mechanical Engineering)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) How is evaporator and condenser temperature defined? Is it the temperature at which refrigerant enters these components? [2]
b) Explain the importance of superheating vapors before suction to compressor. How does it affect COP of the system? [3]
c) Draw ideal and actual p-v diagrams for a reciprocating compressor. [2]
d) What are the advantages and disadvantages of centrifugal compressors over reciprocating compressors? [3]
e) Under what situation, the vapor absorption system of refrigeration is preferred to vapor compression system of refrigeration? [2]
f) "The steam jet refrigeration system is usually not economical above 35^0C condensing temperatures". Justify the statement. [3]
g) What are the factors affecting effective temperature? [2]
h) State the factors that determine human comfort. [3]
i) What are the functions of a fan in an air-conditioning system? [2]
j) What are the advantages and disadvantages of spray type dehumidifier over coil type dehumidifier? [3]

PART - B

(50 Marks)

2.a) Sketch the T-s and p-h diagrams for the vapor compression cycles when the vapor after compression is i) dry saturated and ii) wet
b) A vapor compression works on a simple saturation cycle with R-12 as the refrigerant which operates between the condenser temperature of 40^0C and an evaporator temperature of -5^0C. For the modified cycle, the evaporator temperature is changed to -10^0C and other operating conditions are the same as the original cycle. Compare the power requirement for both cycles. Both systems develop 15 tonnes of refrigeration. [5+5]

OR

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3.a) How does an actual vapor compression cycle differ from that of a theoretical cycle?

b) A single stage NH_3 refrigeration system has cooling capacity of 500 kW. The evaporator and condenser temperatures are -10^0C and 30^0C respectively. Assuming saturation cycle, determine:

i) Mass flow rate of refrigerant

ii) Adiabatic discharge temperature

iii) Compressor work in kW

iv) Condenser heat rejection

v) COP

vi) Compressor swept volume in m^3/min, if volumetric efficiency is 70%. [5+5]

4.a) Make a comparative study of flooded and non-flooded shell and tube type evaporators based on the capacity, condition of vapor leaving the evaporator, heat transfer effectiveness, construction and control.

b) Describe the working of an evaporative condenser. [5+5]

OR

5.a) Give the comparison of air-cooled condenser and water-cooled condenser.

b) Explain the working principle of thermostatic expansion valve with the help of a neat diagram. [5+5]

6.a) Explain with the help of neat sketches, vapor absorption cycle for refrigeration. How is it difficult from vapor compression refrigeration system?

b) Explain steam jet refrigeration system on Enthalpy-entropy diagram and also on temperature entropy diagram. [5+5]

OR

7.a) Explain Electrolux refrigeration system. How the system is operated to obtain different pressures in the cycle without pump?

b) Explain with the help of neat sketches the various components and their functions for a vapor absorption refrigeration system. [5+5]

8.a) Define the term `effective temperature` and explain its significance in the design of air conditioning systems.

b) Air at 40^0C DBT and 15% RH is passed through the adiabatic humidifier at the rate of 200 m^3/ min. The outlet conditions of air are 25^0C DBT and 20^0C WBT. Find [5+5]

i) Dew point temperature

ii) Relative humidity of exit air

iii) Amount of water vapor added to the air per minute.

OR

9.a) Explain clearly the different stages of human body defence against variations of weather conditions during summer and winter.

b) The atmospheric air at 20^0C and 60% relative humidity is heated and humidified in such a way that the final DBT is 30^0C and RH is 50%. Determine the heat and moisture added to the air per minute, if the volume of entering air is 100 m^3/ min. [5+5]

10.a) "The speed reduction is more economical method for decreasing the volume than charging the system resistance". Explain the meaning of the above statement.

b) Discuss the different methods used to remove the odours from the air? [5+5]

OR

11.a) Explain the use of "heat pump" for heating and cooling cycle with neat diagrams.

b) What are different methods of humidifying the air? [5+5]

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