R13

Code No: 126AM

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, July - 2023

REFRIGERATION AND AIR CONDITIONING

(Mechanical Engineering)

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

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART - A

(25 Marks)

1.a) Explain the term tonne of refrigeration in SI units. [2]
b) Define COP (Coefficient Of Performance) in refrigeration. What is its significance? [3]
c) What are the different classifications of compressors used in refrigeration systems? [2]
d) Discuss the impact of condenser selection on the overall efficiency of a refrigeration system. [3]
e) How three-fluid vapor absorption refrigeration systems operate? [2]
f) Enlist the applications of air refrigeration. [3]
g) Why is ventilation important in HVAC system? [2]
h) Define the ESHF (Effective Sensible Heat Factor)? How is it related to load calculations? [3]
i) How is dehumidification achieved in an HVAC system, and why is it necessary? [2]
j) Differentiate between fans and blowers based on their applications. [3]

PART - B

(50 Marks)

2.a) Sketch the T-s and p-h diagrams for the vapor compression cycles when system is super heated and sub cooled.
b) A vapor compression refrigeration system operates with R-134a as the refrigerant. The system has a condenser temperature of 42^0C and an evaporator temperature of -5^0C. The compressor has an isentropic efficiency of 80%. Determine the coefficient of performance of the refrigeration system and the power required by the compressor if the refrigeration capacity is 10 tonne. [4+6]

OR

3.a) What is the purpose of superheating the vapor? How does it increases the cooling effect in a vapor compression refrigeration system?
b) Discuss the various advantages of p-h and T-s curves in finding the performance of a refrigeration system. [3+7]

4.a) Explain the working principle of Capillary tube in a refrigeration system with a neat sketch.

b) List out the differences between rotary and reciprocating compressor. [3+7]

OR

5.a) What are different types of condensers used for refrigeration? Explain the working cycle.

b) What the other accessories required by a refrigeration system for smooth operation. [5+5]

6.a) Define and write the expression for entrainment efficiency in steam jet refrigeration system.

b) How does suction pressure and discharge pressure impact the performance of a vapor compression system? [5+5]

OR

7.a) Find the temperature range through which liquid ammonia containing i) 2% water, ii) 15% water will evaporate at a pressure of 1.5 bar.

b) Explain the working principle of Li-Br vapor absorption system. [5+5]

8. Represent and explain the following weather conditions on psychometric chart
a) Humid and hot
b) Dry and hot
c) Dry and cold. [3+3+4]

OR

9.a) What is the need for ventilation and infiltration?

b) The atmospheric air at 35^0C and 60% relative humidity is heated and humidified in such a way that the final DBT is 25^0C and RH is 50%. Determine the heat and moisture added to the air per minute, if the volume of entering air is 80 m^3 / min. [5+5]

10.a) With help of a circuit diagram, explain how a single air conditioning unit is used as an air-conditioner in summer and heat pump in winter.

b) Explain the various types of axial flow fans. [5+5]

OR

11.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) Air from an air conditioned room is exhausted into atmosphere through a grill. The quantity of air passes through the grill is 25 cubic meter minute. The duct area leading to the grill is 0.125 m^2. The static pressure being the grill is 5 mm of water. Find the effective area of grill exhausting the air into atmosphere. Take the pressure loss passing through the grill as 0.5 mm of water. [5+5]

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