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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech IV Year I Semester Supplementary Examinations August-2021

REFRIGERATION & AIR CONDITIONING

(Common to AGE & ME)

Use of Steam Table & Refrigeration Table Permitted

Time: 3 hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

UNIT-I

- 1 a Explain the working of a Reversed Carnot cycle of refrigeration with P-V and T-S Diagrams. **6M**
- b Define the following terms. **6M**
- i).Refrigeration ii).Heat Engine

OR

- 2 a What is the Necessity of refrigeration? **6M**
- b In a refrigeration plant working on Bell Coleman cycle, air is compressed to 5 bar from 1 bar. Its initial temperature is 10 ° C. After compression, the air is cooled up to 20 ° C in a cooler before expanding to a pressure of 1 bar. Determine the theoretical C.O.P of the plant and net refrigerating effect. Take $C_p = 1.005 \text{ KJ/Kg K}$ and $C_v = 0718 \text{ KJ/Kg K}$. **6M**

UNIT-II

- 3 a With a neat sketch, explain the working principle of vapour compression refrigeration system. **6M**
- b State the desirable properties of refrigerants. **6M**

OR

- 4 The temperature limits of an ammonia refrigerating system are 25° C and -10 ° C. If the gas is dry at the end of compression, calculate the coefficient of performance of the cycle assuming no under cooling of the liquid ammonia. Use the following table for properties of ammonia. **12M**

| Temperature ° C | Liquid Heat (Kj / kg) | Latent Heat (Kj / kg) | Liquid Entropy (Kj / kg K) |
|-----------------|-----------------------|-----------------------|-----------------------------|
| 25 | 298.9 | 1166.94 | 1.1242 |
| -10 | 135.37 | 1297.68 | 0.5443 |

UNIT-III

- 5 a Discuss properties of refrigerant and absorbent combination used in vapour absorption system. **6M**
- b Explain with help of a neat sketch, the working of a steam jet refrigeration system. **6M**

OR

- 6 a Comparison between two fluid VAR systems and three fluid VAR systems. **6M**
- b Describe the working of a vapour absorption refrigeration system with the help of a neat sketch. **6M**

UNIT-IV

- 7 a A room has a sensible heat gain of 24 KW and a latent heat gain of 5.2 KW and it has to be maintained at 26 ° C DBT and 50 % RH. 180 m³ / min of air is delivered to the room. Determine the state of supply of air. **6M**
- b Define relative humidity, absolute humidity. **6M**

OR

- 8 A room 7m × 4m × 4m is occupied by an air-water vapour mixture at 38 ° C. The atmospheric pressure is 1 bar and the relative humidity is 70%. Determine the humidity ratio, dew point, mass of dry air and mass of water vapour. If the mixture of air-water vapour is further cooled at constant pressure until the temperature is 10 ° C. Find the amount of water vapour condensed. **12M**

UNIT-V

- 9 An air conditioning plant is required to supply 60 m³ of air per minute at a DBT of 21 ° C and 55 % RH. The outside air is at DBT of 28 ° C and 60 % RH. Determine the mass of water drained and capacity of the cooling coil. Assume the air conditioning plant first to dehumidify and then to cool the air. Take $W_1=0.0142$, $W_2=0.0084$ kg /kg of dry air, $V_{s2}=0.845$ m³ / kg, $h_1=64.8$ kJ/kg, $h_2=42.4$ kJ/kg. **12M**

OR

- 10 a Which material is commonly used for making ducts in air conditioning systems? **6M**
- b With neat diagram explain the working of summer air conditioning system. **6M**

*** END ***