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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech IV Year I Semester Supplementary Examinations November-2020

REFRIGERATION & AIR CONDITIONING

(Mechanical Engineering)

Time: 3 hours Max. Marks: 60

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

UNIT-I

1 **a** Draw and explain the boot-strap evaporative type of air refrigeration system. **8M**

b Merits and Demerits of Air Refrigeration system. **4M**

OR

2 Air refrigeration used for food storage provides 25 TR. The temperature of air enters in the compressor is 7^0C and the air temperature at exit of the cooler is 27^0C. Find **12M**

(i) COP from the cycle

(ii) power/TR required for compressor, the quantity of air required in the system is 3000kg/hr. The compression &expansion both follows the law of PV1.3=C and Take γ=1.4 and Cp of air is 1kJ/kg K.

UNIT-II

3 **a** Derive the refrigerant numbers for the following chemicals **4M**

(i) CF_4 (ii) $CHCL_2F$ (iii) CH_3Cl (iv) C_2CIF_5

b A refrigerating machine using NH3 operates between the temperature limits of -150 C and 300 C. Find the C O P of the system. Also find the corresponding value for a reversed Carnot cycle operating between the same temperatures. The properties of NH3 are given below: **8M**

Pressure (bar)	Saturation Temp (K)	Enthalpy (kJ/kg)		Entropy (kJ/kg.K)	
		Liquid	Vapour	Liquid	Vapour
2.41	-5	351	1667.5	3.95	9.05
11.895	30	562	1711	4.69	8.48

OR

4 **a** Derive an expression for COP of vapour compression cycle from T-S chart when the refrigerant is dry saturated before compression **6M**

b A vapour compression machine is used to maintain a temperature of -230 C in a refrigerated space. The ambient temperature is 37o C. The compressor takes in dry saturated vapour of F- 12. A minimum 100c temperature difference is required at the evaporator as well as at condenser. There is no sub cooling of the liquid If the refrigerant flow rate is 1 kg/min, Find **6M**

(i)Tonnage of refrigeration

(ii)Power requirement

(iii) Ratio of COP of this cycle to COP of carnot cycle

UNIT-III

5	**a**	Explain solar powered absorption system with neat sketch.	**9M**
	b	What are the functions of analyzer and Rectifier in VAR system	**3M**

OR

6	**a**	Illuminate the working principal of Electrolux refrigeration system with the help of configuration diagram.	**6M**
	b	Clarify actual VAR systems with help of diagram.	**6M**

UNIT-IV

7	**a**	How do you measure DBT, WBT and DPT and also explain when these three becomes equal?	**6M**
	b	An air-water vapour mixture enters an adiabatic saturator at 280C and leave at 180C, which is the adiabatic saturation temperature. The pressure remains at 1.0 bar. Determine the relative humidity and humidity ratio of the inlet mixture.	**6M**

OR

8	**a**	Explain the working of solenoid valve and capillary tube with neat sketch.	**6M**
	b	Atmospheric air at 0.965 bar enters the adiabatic saturator. The wet bulb temperature is 200C and dry bulb temperature is 310C during adiabatic saturation process. Determine (i) humidity ratio of the entering air (ii) vapour pressure and relative humidity at 310C and (iii) Dew point temperature.	**6M**

UNIT-V

9	**a**	Explain summer air conditioning system for hot and dry outdoor condition system with sketch and represent the conditions on P-H chart	**6M**
	b	Explain winter air conditioning system with sketch and also represent the conditions on P-H chart.	**6M**

OR

10		A class room of 60 seating capacity is air-conditioned. The outdoor conditions are 320C DBT and 220C WBT and the required conditions are 220C DBT and 55% R.H. The quantity of outdoor air supplied is 0.5 cmm per student. The conditions are achieved by chemical dehumidifying the air and then cooling by the cooling coil. Find the followings: (i) DBT of the sir leaving the dehumidifier (ii) capacity of the dehumidifier (iii) Capacity of the cooling coil in tons of refrigeration (iv) If the bypass factor of the cooling coil is 0.3. then find the d=surface temperature of the cooling coil required	**12M**

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