QP Code: RM23MTECH141 Reg. No | | | | | | | | | | | AY 23

GIET UNIVERSITY, GUNUPUR – 765022

M. Tech (Second Semester) Examinations, May – 2024

MPETE2031 – Advanced Refrigeration Engineering

(Heat Power & Thermal Engineering)

Time: 3 Hrs Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer all questions	CO#	Blooms Level
a. Explain 1 TR.	CO1	K1
b. Explain the effect of discharge pressure on COP.	CO1	K2
c. List the advantages VCRS over VARS.	CO2	K1
d. Sketch the T-s and p-h diagrams for the VCRS cycle when the vapour is super-heated at the end of compression.	CO1	K2
e. Explain defrosting and frosting evaporator.	CO2	K2
f. Explain the function of rectifier and analyser in VARS.	CO4	K1
g. Explain the reason of using capillary tube over other expansion devices in household refrigerator.	CO2	K1
h. Define sensible heat factor and latent heat.	CO3	K1
i. Write on bypass factor of heating coils.	CO3	K2
j. State the factors that affect comfort air conditioning.	CO4	K1

PART – B **(10 x 5=50 Marks)**

Answer ***ANY FIVE*** questions	Marks	CO#	Blooms Level
2. In an open cycle air refrigeration machine, air is drawn from a cold chamber at -2^{O}C and 1 bar and compressed to 11 bar. It is then cooled at this pressure, to the cooler temperature of 20^{O}C and then expanded in expansion cylinder and returned to the cold room. The compression and expansion are isentropic and follows the law $pv^{1.4}$ = constant. The capacity of refrigeration is 15TR. Calculate the theoretical COP and rate of air circulation in kg/min.	10	CO2	K3
3.a. Describe the regenerative air refrigeration system with schematic diagram.	5	CO2	K2
b. Difference between air cooled condenser and water cooled condenser.	5	CO2	K2
4. A refrigerator using carbon dioxide as a refrigerant works between the temperatures 17.5^{O}C and -17.5^{O}C. The gas leaves the compressor at 30^{O}C. The gas is completely condensed but there is no undercooling. Calculate the theoretical COP.	10	CO1	K3

Temp.	Enthalpy (kJ/kg)			Entropy (kJ/kgK)	
^{O}C	h_F	h_{FG}	h_G	S_F	S_G
17.5	470	639.6	169.6	4.37	4.95
-17.5	378.5	628	279.5	4.05	5.12

5.	Explain the working of Li Br refrigeration system with neat sketch.	10	CO1	K2
6. a.	Atmospheric air with dry bulb temperature of 28° C and a wet bulb temperature of 17°C is cooled to 15°C without changing its moisture content. Find: 1. original relative humidity 2. Final relative humidity and 3. Final wet bulb temperature.	5	CO3	K3
b.	Air is supplied to a conditioned room at 17°C DBT and 50% RH. The air leaves the room at 25°C DBT during which RH increases by 5%. Find (i) DPT of supply air (ii) Change in enthalpy during process. (iii) Change in specific humidity during the process. Show it on psychrometric chart.	5	CO3	K3
7.	Saturated air at 21°C is passed through a drier so that its final relative humidity is 20%. The drier uses silica gel adsorbent. The air is then passed through a cooler until its final temperature is 21°C without a change in specific humidity. Determine: 1. The temperature of air at the end of the drying process; 2. the heat rejected during the cooling process; 3. the relative humidity at the end of cooling process; 4. the dew point temperature at the end of the drying process; and 5. the moisture removed during the drying process.	10	CO3	K3
8.a.	An air conditioning plant is required to $60m^3$ of air per minute at a DBT of $21^{O}C$ and 55% RH. The outside air is at DBT $28^{O}C$ and 60% RH. Determine the mass of water drained and capacity of cooling coil. Assume the air conditioning plant first to dehumidify and then to cool the air.	6	CO4	K3
b.	Explain the working of summer air conditioning system.	4	CO4	K2

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