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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Regular and Supplementary Examination December 2021 (2015 Scheme)

Course Code: ME405

Course Name: REFRIGERATION AND AIR CONDITIONING

Max. Marks: 100 Duration: 3 Hours

Use of Refrigeration tables, Charts and Psychrometric chart is permitted.

PART A

Answer any three full questions, each carries 10 marks. Marks

1 a) Explain processes in reversed Carnot cycle with P-V and T-S diagram. (5)

b) Capacity of a refrigerator is 600 tons when working between -5 ^{0}C and 20 ^{0}C. Find the mass of ice produced within 24 hours when water is supplied at 10 ^{0}C. Also find the minimum kW required. Assume the cycle of operation is Carnot cycle. Latent heat of ice = 336 kJ/kg. (5)

2 a) Write a short note on the Joule Thomson Throttling experimentation and what is the condition of J-T coefficient for cooling? (5)

b) Derive, with the help of T-S diagram, the expression for net work done in actual reverse Brayton cycle with non-isentropic compression and expansion processes and with pressure drops in cold and hot heat exchangers. (5)

3 a) Explain the working of Bootstrap Air Refrigeration System with T-S diagram. (5)

b) Explain, with the help of schematic diagram, the Adiabatic Demagnetization of paramagnetic salts. (5)

4 a) Explain, with the help of p-h and T-s diagrams, the effects of subcooling and superheating on the COP of vapour compression Refrigeration system. (5)

b) A refrigerating machine using air as working fluid and working on closed Bell-Coleman cycle operates under the following conditions. Refrigerator temperature = 150 K, cooler temperature = 300 K. The air temperature at the entry of the refrigerator is 40 K less than the refrigerator temperature. Pressure in the refrigerator = 1 bar, calculate (a) refrigeration effect (b) net work done (c) COP of machine and (d) Cooler pressure. Assume expansion and compression to be isentropic. (5)

PART B

Answer any three full questions, each carries 10 marks.

5 a) Explain the two stage compression with intercooling and subcooling by external cooling source with the help of its p-h diagram. (5)

	b)	Explain the working of hermitically sealed reciprocating compressor used in VCRS.	(5)
6	a)	Explain how Ozone Depletion Potential and Global Warming Potential affect the selection of refrigerant?	(5)
	b)	Write a short note on R-134a.	(5)
7	a)	How refrigerant leakage can be detected?	(5)
	b)	Explain quick freezing method.	(5)
8	a)	What is flooded evaporator and what are its advantages?	(4)
	b)	Describe, with neat sketches, any three controllers used in refrigeration systems.	(6)

PART C

Answer any four full questions, each carries 10 marks.

9	a)	Given that DBT = 25 ^{0}C and DPT = 17.5 ^{0}C, find the condition of air (a) WBT (b) Relative Humidity (c) specific volume (d) enthalpy	(5)
	b)	Write a short note on Comfort chart and Bypass factor.	(5)
10		In an air conditioning system, the inside and outside conditions are dry bulb temperature 25 ^{0}C, relative humidity 50 % and dry bulb temperature 40 ^{0}C, wet bulb temperature 27 ^{0}C respectively. The room sensible heat factor is 0.8. 50 % of the room air is rejected to atmosphere and an equal quantity of fresh air added before air enters the air conditioning apparatus. If the fresh air added is 100 m^3/min, determine: (a) room sensible and latent heat load (b) sensible and latent heat load due to fresh air (c) apparatus dew point (d) humidity ratio and dry bulb temperature of air entering air conditioning apparatus. Assume by-pass factor as 0, density of air as 1.2 kg/m^3 at a total pressure of 1.01325 bar.	(10)
11	a)	Using psychrometric schematic, show how to calculate ADP if RSHF is given.	(5)
	b)	Explain DPT and ERSHF line in psychrometric chart.	(5)
12	a)	Explain the working of Year-round Air Conditioning system with schematic.	(5)
	b)	Explain the equal friction loss method in air conditioning design?	(5)
13		What are the air conditioning design requirements in designing an operation theatre in hospital?	(10)
14		How can we calculate the internal and external cooling loads of a room?	(10)

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