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Code No. : 17542 S N/O

**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD**

Accredited by NAAC with A++ Grade

**B.E. (Mech. Engg.) VII-Semester Supplementary Examinations, May/June-2023**

**Refrigeration and Air Conditioning (PE-II)**

Time: 3 hours

Max. Marks: 60

Note: i) Answer all questions from **Part-A** and any **FIVE** from **Part-B**

ii) Use of **R&A/C Tables and charts** permitted.

**Part-A (10 × 2 = 20 Marks)**

Q. No.	Stem of the question	M	L	CO	PO
1.	A machine works on reversed Carnot cycle between temperature range of $-5^{\circ}\text{C}$ and $20^{\circ}\text{C}$ . Determine COP when it works as i) Refrigerator ii) Heat pump.	2	2	1	2
2.	Name any four refrigerants used in Vapor compression refrigeration applications.	2	1	1	1
3.	Sketch the vapor compression refrigeration cycle when the vapor is i) dry and saturated at the end of compression ii) super-heated at the beginning of compression.	2	1	2	1
4.	Write the function of condenser and compressor in a simple VCR system.	2	1	2	1
5.	The heat input of a VAR system is 60kW and refrigeration produced is 22TR. Find the COP.	2	2	3	2
6.	List the applications and advantages of steam jet refrigeration.	2	1	3	1
7.	In an air conditioning process, the partial pressure of water vapor is 0.057bar and atmospheric pressure is 1.013bar, find humidity ratio.	2	2	4	2
8.	The bypass factor of a cooling coil is 0.35, find its efficiency.	2	1	4	2
9.	Define RSHF and GSHF.	2	1	5	1
10.	Compare domestic refrigerator and room air conditioner.	2	2	5	1
<b>Part-B (5 × 8 = 40 Marks)</b>					
11. a)	Derive the expression for the COP of a Bell Coleman cycle.	4	3	1	2
b)	A one Ton of air compression refrigeration plant is to be maintained at a temperature of $-12^{\circ}\text{C}$ in the cold room when the atmospheric temperature is $37^{\circ}\text{C}$ . assume reversible heat transfer in the cooler and cold room. Compressor pressure at inlet is 1.3bar and discharge pressure is 6.5bar. Find i) mass flow rate of air per hour ii) Net work done iii) Refrigeration effect iv) COP.	4	4	1	2

12. a)	Discuss the working of a simple vapor compression refrigeration system with a schematic diagram.	4	2	2	1															
b)	A 5Ton Freon-12 refrigeration plant has suction temperature of -10°C and condenser temperature of 30°C and there is no under-cooling of refrigeration liquid. Assume isentropic compression Find i) Mass flow rate of refrigerant ii) Heat rejection at condenser iii) Power required to run the compressor iv) COP. Take the following properties of Freon-12 and take $C_p$ (Superheated vapor)	4	4	2	2															
<table border="1"> <thead> <tr> <th>Pressure(bar)</th> <th>Temperature(°C)</th> <th><math>h_f</math>(kJ/kg)</th> <th><math>h_g</math>(kJ/kg)</th> <th><math>S_g</math>(kJ/kg-K)</th> </tr> </thead> <tbody> <tr> <td>8</td> <td>30</td> <td>130.5</td> <td>264.5</td> <td>1.542</td> </tr> <tr> <td>2.6</td> <td>-10</td> <td>---</td> <td>249.3</td> <td>1.557</td> </tr> </tbody> </table>						Pressure(bar)	Temperature(°C)	$h_f$ (kJ/kg)	$h_g$ (kJ/kg)	$S_g$ (kJ/kg-K)	8	30	130.5	264.5	1.542	2.6	-10	---	249.3	1.557
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13. a)	Explain the working of steam jet refrigeration system with a line diagram.	4	4	3	1															
b)	Illustrate the working of Electrolux refrigeration system with a neat sketch.	4	2	3	1															
14. a)	Sketch i) Adiabatic humidification process ii) Chemical dehumidification process on psychrometric chart.	4	2	4	1															
b)	The air at 30°C DBT and 25°C WBT is heated to 40°C. If the air supply is 250cmm, then find the amount of heat added per minute and RH and WBT of the air.	4	4	4	2															
15. a)	Air at 31CDBT and 18.5C WBT is passed through a cooling coil maintained at 4.4C.the heat extracted by the cooling coil from air is 12.5kw and air flowrate is 39.5m <sup>3</sup> /min. Determine DBT and WBT of the air leaving the coil and coil bypass factor.	4	4	5	2															
b)	Discuss the working of split air conditioning system with a line diagram.	4	2	5	1															
16. a)	Discuss the classification and properties of refrigerants.	4	1	1	1															
b)	Explain the working of bell Coleman refrigeration cycle.	4	4	2	1															
17.	Answer any <i>two</i> of the following:																			
a)	Sketch and explain the working of Lithium bromide-water VAR system.	4	4	3	1															
b)	Explain the working of any one Psychrometer with the help of a sketch.	4	4	4	1															
c)	List different sensible and latent heat sources into a residential building.	4	4	5	1															

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level - 1	20%
ii)	Blooms Taxonomy Level - 2	30%
iii)	Blooms Taxonomy Level - 3 & 4	50%