Roll No:

G H Raisoni Institute of Engineering and Business Management, Jalgaon

(An Autonomous Institute affiliated to Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon)
Accredited by NAAC with 'A' Grade

Department of Mechanical Engineering
End Semester Examination Summer-2022-23

Program Name: B-Tech **Semester: VIII**
Subject Name: Refrigeration & Air conditioning **Subject Code: 812801**
[Time: 02hrs.] **[Max. Marks: 60]**

Course Outcomes (COs):
At the end of the course the student should be able to:

CO1: Understand the principles of refrigeration and remember the application of air refrigeration.
CO2: Learn the working of single stage, multistage and multi-Evaporator using vapour compression refrigeration system with different type of refrigerants.
CO3: Study the working principles and its application of vapor absorption refrigeration system.
CO4: Apply the knowledge of psychrometry to various psychrometric processes in Airconditioning system.
CO5: Learn different types of Air-Conditioning system used for Human comfort and Use P-h, T-S and Psychometric charts to solve refrigeration and Air conditioning design problems.

Instructions:
1) Attempt any one sub-question from each Question. Each question carries equal marks
2) Clearly mention Seat number, PRN No, Course Name and Course Code on answer sheet
3) Draw a neat and labeled diagram, if required
4) Assume suitable data wherever necessary
5) Only non- programmable calculator is allowed.
6) Steam Table and Psychrometric Chart are permitted.

Instructions:
1) Attempt any Two from each question
2) Each question carries equal marks
3) Use of non-programmable scientific calculation is permitted.
4) Do not write anything on question paper except Roll No

<table>
<tr><th colspan="2">Q. No.</th><th>Questions</th><th>Marks</th><th>COs</th><th>BL</th></tr>
<tr><td>1</td><td>A</td><td>Discuss air conditioning in theater.</td><td>5</td><td>CO-1</td><td>2</td></tr>
<tr><td></td><td>B</td><td>Dense air refrigeration system of 10 TR capacity operates between pressure of 4 bar and 16 bar. The air temperature after heat rejection to surrounding is 37°C and air temperature at exit of refrigerator is 7°C. Determine (i) Compressor and Turbine work per TR (ii) COP (iii) Power required per TR. Take $pv^{1.25}$ = C and C_P = 1 kJ/kg K.</td><td>5</td><td>CO-1</td><td>3</td></tr>
<tr><td></td><td>C</td><td>Discuss Regeneration Air Refrigeration Systems with state diagrams.</td><td>5</td><td>CO-1</td><td>2</td></tr>
<tr><td>2</td><td>A</td><td>Discuss Reversed Carnot cycle with state diagrams and its limitations.</td><td>5</td><td>CO-2</td><td>2</td></tr>
<tr><td></td><td>B</td><td>A 2TR, HFC134a based air conditioner worked on simple VCC system operates between 12°C and 50°C. Determine COP and power per ton of refrigeration. Take c_{pv} = 1.218 kj/kg K
<table>
<tr><th>Temperature °C</th><th>h_f (kj/kg)</th><th>h_{fg} (kj/kg)</th><th>s_f (kj/kg K)</th><th>s_g (kj/kg K)</th></tr>
<tr><td>12</td><td>-</td><td>405.51</td><td>1.0579</td><td>1.7215</td></tr>
<tr><td>50</td><td>271.59</td><td>423.63</td><td>1.2373</td><td>1.7078</td></tr>
</table></td><td>5</td><td>CO-2</td><td>3</td></tr>
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	C	Discuss various factors affecting performance of vapor compression refrigeration system.	5	CO-2	2
3	A	Discuss advantages and disadvantages of Multistage vapor compression system over single stage system.	5	CO-2	2
	B	Explain Montreal Protocol, Kyoto Protocol, ODP & GWP.	5	CO-2	2
	C	Classify various types of refrigerants with suitable examples.	5	CO-2	4
4	A	Explain Li Br Vapor absorption system.	5	CO-3	2
	B	Derive expression for maximum COP of Vapor Absorption Refrigeration System.	5	CO-3	3
	C	In an absorption system, heating, cooling and refrigeration takes place at 150°C, 30°C and -20°C respectively. Find the theoretical COP of the system. If the generator temperature is increased to 190°C and evaporator temperature is decreased to -30°C, Find the percentage change in theoretical COP.	5	CO-3	2
5	A	Explain RSHF, ESHF, WBT, Specific Humidity, Degree of Saturation.	5	CO4	2
	B	WBT and DBT of air are 18°C and 30°C. Calculate specific humidity, relative humidity, enthalpy and DPT of air using steam table.	5	CO4	3
	C	Discuss (i) Heating and Humidification (ii) Cooling and Dehumidification. Draw processes on Psychrometric chart.	5	CO4	2
6	A	Explain working of window air conditioner with neat sketch.	5	CO5	2
	B	Differentiate reciprocating compressor and rotary compressor.	5	CO5	2
	C	10 cmm air at 37°C DBT, 24% RH, flow through a desert cooler having an adiabatic efficiency of 75%. Calculate final DBT AND RH, and how much water is required in kg/hr. Use Psychrometric chart.	5	CO5	3

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BL- Bloom's Taxonomy Levels s (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating
