BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: B. TECH **SEMESTER: VII**
BRANCH: MECHANICAL **SESSION: MO/2022**

SUBJECT: ME401 REFRIGERATION AND AIRCONDITIONING

TIME: 2 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. **The total marks of the questions are 25.**
2. **Candidates attempt for all 25 marks.**
3. **Before attempting the question paper, be sure that you have got the correct question paper.**
4. **The missing data, if any, may be assumed suitably.**
5. **Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.**

				CO	BL
Q1	(a)	Define: (i) one ton of refrigeration and (ii) coefficient of performance.	[2]	CO1	L1
	(b)	Draw the T-s diagram of actual Bell-coleman cycle showing various processes and argue why it is different from ideal cycle	[3]	CO1	L2
Q2		With neat sketch, explain the construction working of Bootstrap air- refrigeration system. Also show the various processes in T-s diagram with its component analysis.	[5]	CO1	L3
Q3		An aircraft refrigeration plant has to handle a cabin load of 25 tonnes. The atmospheric temperature is 16°C. The atmospheric air is compressed to a pressure 0.96 bar and temperature of 29°C due to ram action. This is then further compressed in a compressor to 4.8 bar, cooled in a heat exchanger to 66 °C, expanded in a turbine to 1 bar pressure and supplied to the cabin. The air leaves the cabin at a temperature of 26°C. The isentropic efficiencies of both compressor and turbine are 0.9. Calculate: (i) Mass of air circulated per minute, (ii) COP take γ=1.4 and c_p=1.005 kJ/kg.	[5]	CO1	L3
Q4	(a)	Argue, why carnot VCRS is not practically possible by supporting it with T-s diagram.	[2]	CO2	L5
Q4	(b)	A refrigerator works between -7°C and 27°C. The vapour is dry at the end of compression. There is no subcooling and the expansion is by throttle valve. Determine: (i) The COP (ii) Power of the compressor to remove 180 kJ/min. The properties of the refrigerant are given below	[3]	CO2	L3

Saturation temperature, °C	h_f, kJ/kg	h_{sg}, kJ/kg	s_f, kJ/kgk	s_g,kJ/kg
-7	-30	1298	-0.108	4.75
27	115	1173	427	4.33

Q5		With neat sketch explain the working of Multi-evaporator system with single compressor and individual expansion valves. Draw the P-h plot and show the various process.	[5]	CO2	L3

:::::: 28/09/2022 ::::::M