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Model Question Paper 2022-23 (CBCS Scheme)
Sixth Semester B.E. Degree Examination (Mechanical Engineering)

Refrigeration and Air Conditioning

TIME: 03 Hours

Max. Marks: 100

- Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
 02. M: Marks, L: Blooms Level, C: Course outcomes
 03. Use of Thermodynamics Data Hand Book is permitted.
 04. Assume missing data suitably

Q. No.	Module - I		M	L	C
1	a	Define refrigeration and explain the ASHRAE nomenclature for refrigerating systems.	10	L2	CO1
	b	A refrigerating system operates on the reversed carnot cycle. The higher temperature of the refrigerant in the system is 35°C and the lower temperature is - 15°C. The capacity is to be 12 tonnes. Neglect all losses. Determine : (i) Co-efficient of performance; ii) Heat rejected from the system per hour; (iii) Power required.	10	L3	CO1
OR					
2	a	Explain the working of the Linde and Claude cycles for the liquefaction of air. Highlight the role of the Joule-Thomson effect.	10	L2	CO1
	b	An air refrigeration system working on Bell - coleman cycle with 15 TOR capacity has its pressure range 1 bar to 10 bar. Air enters the compressor at -5° C and enters the expander at 25° C. Assuming isentropic expansion and compression, find COP, air flow rate and power required.	10	L3	CO1
Module – II					
3	a	Illustrate the modifications made to the standard vapor compression cycle to improve its COP.	10	L2	CO2
	b	An ammonia refrigerator produces 30 tonnes of ice at 0° C from water at 20°C. The temperature range of working cycle is 25 to -15° C. The vapour is dry saturated at the end of compression. Assuming actual COP is 60% of theoretical COP, calculate the power required to drive the compressor. Latent heat of ice = 335 kJ/kg	10	L3	CO2
OR					
4	a	Describe the Grindlay and Lorenz cycles with neat schematic diagrams	10	L2	CO2
	b	Analyze the impact of superheat horn and throttling loss on the performance of various refrigerants in the Vapour Compression Cycle.	10	L3	CO2
Module – III					
5	a	Compare the working of Aqua-Ammonia and Lithium-Bromide absorption systems.	10	L2	CO3

	b	In an absorption type refrigerator, the heat is supplied to NH ₃ generator by condensing steam at 2 bar and 88 per cent dry. The temperature in the refrigerator is to be maintained at - 4°C. Find the maximum C.O.P. possible. If the refrigeration load is 18 tonnes and actual C.O.P. is 72 per cent of the maximum C.O.P., find the mass of steam required per hour. Take the temperature of the atmosphere as 25°C.	10	L3	CO3
OR					
6	a	With a schematic, explain the working of a steam jet refrigeration system. State its advantages and limitations.	10	L2	CO3
	b	With a suitable sketch, illustrate the working principle of vapour absorption refrigeration system.	10	L3	CO3
Module – IV					
7	a	Differentiate between primary and secondary refrigerants.	10	L2	CO6
	b	Describe different types of expansion devices used in refrigeration systems with neat sketches.	10	L3	CO6
OR					
8	a	Discuss the desirable properties of refrigerants with respect to environmental and thermodynamic aspects.	10	L2	CO6
	b	Describe the working principles and types of major refrigeration system components-compressors, condensers, expansion devices, and evaporators.	10	L3	CO6
Module – V					
9	a	Define air conditioning and classify the different types of air conditioning systems based on applications and working principles.	10	L2	CO5
	b	Derive expressions for cooling and heating load in an air-conditioned space using psychrometric principles.	10	L3	CO4
OR					
10	a	Differentiate between central and unitary air-conditioning systems. List the advantages of packaged AC units.	10	L2	CO5
	b	The following data relate to a conference room for seating 80 persons. Inside design conditions.....22°C DBT, 55% RH Outside design conditions.....38° DBT, 28°C WBT Sensible and latent heat loads per person...75 W and 45 W respectively Lights and fans loads.....12000W Sensible heat gain through glass, walls, ceiling....12000 W Air infiltration.....18 m ³ /min Fresh air supply....80 m ³ /min. By-pass factors of the coils.....0.1 If two-third of recirculated room air and one-third of fresh air are mixed before entering the cooling coils, determine: (i) Apparatus dew point; (ii) Grand total heat load; and (iii) Effective room sensible heat factor.	10	L3	CO4