CONTINUOUS INTERNAL EVALUATION- 3

Dept: ME	Sem / Div: 4th A	Sub: Applied Thermodynamics	S Code: 18ME42
Date: 02/09/2022	Time: 9.30-11.00 am	Max Marks: 50	Elective: N

Note: Answer any 2 full questions, choosing one full question from each part

QN		Questions	Marks	RBT	COs
		PART A			
1	a	Explain the working principle of Vapor compression refrigerator with suitable TS, PH & Bock diagram	7	L2	CO4
	b	A refrigeration system operates on the reversed Carnot cycle. The higher temperature of the refrigerant in the system is 50°C and lower temperature is -10°C. The Capacity is to be 10 Tones. Neglect all the losses	8	L3	CO4
	c	A Simple NH_3 vapor compression system has a condenser temperature of 30°C & an Evaporator temperature of -15°C. The liquid is sub cooled by 10°C. The volumetric efficiency of the compressor is 0.8. Find the following for Dry Compression sub cooled condition: The refrigerating effect, Flow rate of refrigerant, Volume capacity of compressor, COP & The power per TOR.	8	L3	CO4
		OR			
2	a	Explain the working principle of Vapor absorption refrigerator with suitable Block diagram	7	L2	CO4
	b	An ideal air refrigeration cycle was designed with following specifications with respect to air: Compressor inlet pressure is 103.42kPa, Compressor Outlet pressure is 413.7kPa, Temperature at Compressor inlet is -7°C & Temperature at Turbine inlet is 27°C. Find: COP of the cycle, Power required to produce 1 TOR & Air circulation rate if compression and expansion is adiabatic.	8	L3	CO4
	c	An ammonia ice plant operates between a Condenser temperature of 35°C and an Evaporator temperature of -15°C. It produces 10 tons of ice from water at 30°C to ice at -5°C in one day. Find the following for VCR plant: Capacity of the Plant, Mass flow rate of the ammonia, Compressor Power, COP of the Plant, if Cp_w= 4.187kJ/kg.K, Cp_{ice} = 1.94kJ/kg.K, Latent heat of fusion = 335kJ/kg.	8	L3	CO4
		PART B			
3	a	Derive an expression for Work done of a Reciprocating compressor without considering Clearance volume for a) adiabatic process b) Isothermal process	7	L2	CO4
	b	An air compressor takes in air at 1 bar and 20°C and compresses the same according to the law $pV^{1.2}$= constant. It is then delivered to a reciever at a constant pressure of 10bar. If R = 0.287kJ/kg.K. determine the temperature at the end of compression, Net work consumed and heat transferred during compression per kg of air supplied.	8	L3	CO4
	c	A single stage air compressor of 18cm diameter and 120cm stroke length runs at 120rpm and operates between 1 bar and 10 bar. The lowest temperature of the cycle is 15°C. Compression index is 1.3. Estimate the Power & final temperature of air for a)Single acting & b) Double acting	8	L3	CO4

Prepared by: 25/8/22

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OR

4	a	Derive an expression for Volumetric efficiency of a Reciprocating compressor for Polytrophic process.	7	L2	CO4
	b	A double acting single stage compressor with piston displacement of $0.04m^3$ per stroke operates at 480rpm. The clearance is 4% and it receives air at 100kPa and discharges at 500kPa. The compression and expansion is polytrophic, $pV^{1.3}$ = Constant. Determine the Power required and the air discharged in m^3/sec.	8	L3	CO4
	c	The LP cylinder of a compound air compressor draws in $0.1m^3$ of air at a temperature of 15°C and pressure 1 bar. It compresses the air adiabatically to 2 bar and then delivers it in to a receiver where the air is cooled to 25°C. This air is drawn in to a HP cylinder and compressed adiabatically to 5bar and delivered to the receiver. Find the power required when the compressor makes 100rpm. What pressure in the receiver would give the best efficiency assuming other data as above.	8	L3	CO4

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