Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

M.Tech. (Second Semester - Regular) Examinations, May – 2026

24MTEPE12001 – Advanced Refrigeration Engineering

Time: 3 hrs Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Define the term by-pass factor.	CO5	K1
b. Differentiate the primary and secondary refrigerants.	CO2	K1
c. Write atleast one advantage and disadvantage of capillary tube over expansion valve.	CO4	K2
d. Describe the function of rectifier in VARS.	CO3	K2
e. Express the expression of BPF for cooling coil.	CO6	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. The ambient conditions for an air craft cruising at 1000 km/h are 0.35 bar and -15°C. The cabin temperature is 25°C and turbine exit pressure is 1.06 bar. The pressure ratio of the compressor is 3. Assuming 100% efficiency for ram effect, compressor and turbine and ideal heat exchangers, determine for simple gas refrigeration cycle of 20 TR capacity: 1. Temperatures and pressures at all points of the cycle; 2. Mass flow rate and volume flow rates at compressor inlet and turbine outlet; 3. Work requirement and C.O.P. Assume c, = 1.005 x 10^3J/kg K; R_{air} = 286 J/kg K; and ϒ = 1.4.	10	CO1	K3
(OR)			
b. A single compressor using R-12 as refrigerant has three evaporators of capacity 30 TR, 20 TR and 10 TR. The temperature in the three evaporators is to be maintained at -l0°C, 5°C and l0°C respectively. The condenser pressure is 9.609 bar. The liquid refrigerant leaving the condenser is sub-cooled to 30°C. The vapours leaving the evaporators are dry and saturated. Assuming isentropic compression, find (a) the mass of refrigerant flowing through each evaporator; (b) the power required to drive the compressor: and (c) C.O.P. of the system.	10	CO1	K3
3.a. In a vapor compression refrigeration system using R-12, the evaporator pressure is 1.4 bar and the condenser pressure is 8 bar. The refrigerant leaves the condenser sub-cooled to 30°C. The vapor leaving the evaporator is dry and saturated. The compression process is isentropic. The amount of heat rejected in the condenser is 13.42 MJ/min. Determine: (i) Refrigerating capacity (ii) Refrigerating load in TR (iii) Compressor input in kW (iv) C.O.P	10	CO2	K3
(OR)			

b.	A 100 tonne refrigerating plant using R-12 has a condensing temperature of 35°C and an evaporating temperature of 5°C. Evaluate the power requirement of the compressor in kW, the volume rate of the compressor and the compressor displacement volume if the volumetric efficiency is 75% and mechanical efficiency is 80%.	10	CO2	K3
4.a.	Explain the working of Claude liquefaction system with suitable sketch.	10	CO3	K2
	(OR)			
b.	Explain with neat schematic diagram the working principle of dry ice manufacturing.	10	CO3	K2
5.a.	Explain the types of condenser in details.	5	CO4	K2
b.	Explain with neat sketch the working of summer air conditioning system.	5	CO5	K2
	(OR)			
c.	Write a short note on the factors affecting comfort air conditioning.	5	CO5	K2
d.	Explain the various properties of a good refrigerant.	5	CO4	K2
6.a.	A building has the following calculated cooling loads. RSH gain = 310 kW, RLH gain=100 kW The space is maintaining at DBT=27^{o}Cand RH =60%.The outside air is at 35^{o}C and 80^{o}C RH.10% by mass of supplied to the building is outdoor air. If the air supplied to the space is not be at a temperature lower than 18^{o}C, find: a) Minimum amount of air supplied to the space in m^3/s. b) Capacity, ADP, BPF and SHF of the cooling coil.	10	CO6	K3
	(OR)			
b.	The atmospheric air at 30° C dry bulb temperature and 75% relative humidity enters a cooling coil at the rate of 200m3/min. The coil dew point temperature is 14°C and the by-pass factor of the coil is 0.1. Determine: 1. the temperature of air leaving the cooling coil; 2. the capacity of the cooling coil in tonnes of refrigeration and in kilowatt 3. the amount of water vapour removed per minute; and 4. the sensible heat factor for the process.	10	CO6	K3

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