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

B. Tech (Sixth Semester - Regular) Examinations, April 2026

23BMEPE36011 – Refrigeration and Air Conditioning

(Mechanical 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. Explain the concept of tonne of refrigeration.	CO1	K2
b. Apply the principles of refrigeration to justify the need for air conditioning in aircraft at high altitudes.	CO1	K3
c. Analyse the concept of environmental impact to assess the effects of CFC refrigerants.	CO4	K3
d. Explain **t**he role of hydrogen in the Electrolux (three-fluid) refrigeration system.	CO2	K2
e. Apply the concept of bypass factor to evaluate its effect on the performance of a cooling/heating coil.	CO5	K3

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. The temperature of a household refrigerator is 0°C and the room temperature is 23°C. The heat flow into the refrigerator is 1000 kJ/hr. Considering the refrigerator as Carnot refrigerator find the required power.	5	CO1	K3
b. Apply the principles of air refrigeration to illustrate and explain the working of a simple air refrigeration system with a neat sketch and justify its applications.	5	CO1	K3
(OR)			
c. A simple air cooled system is used for an aeroplane having a loud of 9 tonnes. The atmospheric pressure and temperature are 0.9 bar and 10°C respectively. During ramming pressure increases to 1.013 bar. In the heat exchanger, the temperature of air is reduced by 60PC. The pressure in the cabin la 1.01 bar and the temperature of air leaving the cabin is 25°C. Determine: i. Power required to take the load of cooling in the cabin. ii. C.O.P. of the system Assume that all expansion and compressions are isentropic. The pressure of the compressed air is 4 bar	10	CO1	K3
3.a. An ammonia refrigeration machine works between the temperature of -10°C and 30°C. The vapour leaves the compressor in dry and saturated condition and temperature of the liquid refrigerant leaving the condenser is 30°C. Find the kilogram of ice produced per kW-Hour assuming actual COP is 65% of theoretical. The quantity of heat carried per kg of the is 370 kJ/kg.	10	CO3	K4

Temp (°C)	h_f (kJ/kg)	h_{fg} (kJ/kg)	s_f (kJ/kg K)	s_g (kJ/kg K)
30	28.5	290.8	0.096	1.055
-10	8.84	323	0.033	1.191

(OR)

b.	In a vapour compression refrigerator, the working fluid is superheated at the end of compression and is undercooled in the condenser before throttling. Sketch such a working cycle on T-S diagram and show how theoretical coefficient of performance may be calculated from this diagram.	10	CO3	K4
4.a.	Compare different types of compressors used in refrigeration systems with respect to their performance and applications.	5	CO2	K3
b.	Classify refrigerants based on their chemical composition and explain their nomenclature with examples.	5	CO4	K3
	(OR)			
c.	Apply the working principles of different compressors to select a suitable compressor for a domestic refrigeration system and justify your choice.	5	CO2	K3
d.	Analyse the properties of commonly used refrigerants and recommend a suitable refrigerant for eco-friendly refrigeration applications with justification.	5	CO4	K3
5.a.	Explain the working of a simple ammonia–water vapour absorption refrigeration system with a neat sketch.	5	CO3	K3
b.	Apply the principles of psychrometry to evaluate heating and humidification processes.	5	CO5	K3
	(OR)			
c.	Illustrate the working of the Electrolux (three-fluid) refrigeration system and identify the role of each fluid.	5	CO3	K3
d.	Apply the principles of psychrometry to evaluate cooling and dehumidification processes.	5	CO5	K3
6.a.	The atmospheric air at 760 mm of Hg, dry bulb temperature 15°C and wet bulb temperature 11°C enters a heating coil whose temperature is 41°C. Assuming by-pass factor of heating coil as 0.5, determine: Dry bulb temperature, Wet bulb temperature and Relative humidity of the air leaving the coil. Also determine the sensible heat added to the air per kg of dry air.	10	CO6	K4
	(OR)			
b.	In a cooling application, moist air enters a refrigeration coil at the rate of 100 kg of dry air per minute at 35°C and 50% relative humidity. The apparatus dew point of coil is 5°C and by-pass factor is 0.15. Determine: The outlet state of moist air and the cooling capacity of the coil in TR.	10	CO6	K4

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