Indian Maritime University

(A Centra8l University, Govt of India)

End Semester Examinations – June 2025

Programme Name: B Tech (ME)

Semester: IV

Subject Code: UG11T4408

Subject Name: REFRIGERATION AND AIR CONDITIONING

Date: 16.06.2025 Max Marks: 70

Duration: 03 Hrs Pass Marks: 35

General Instructions

(i) All Sections (A, B & C) are to be attempted.

(ii) Options, if any, are specified in respective section.

(iii) Psychometric chart to be used.

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. During a refrigeration cycle, heat is rejected by the refrigerant in a _____
(a) Condenser
(b) Compressor
(c) Evaporator
(d) Expansion Valve

2. The use of suction line accumulator is to
(a) Prevent vapour refrigerant to enter evaporator
(b) Prevent vapour refrigerant to enter compressor
(c) Increase suction pressure
(d) Prevent liquid refrigerant to enter compressor

3. In a domestic refrigerator, periodic defrosting is required because frosting
(a) Causes corrosion of materials (b) Reduces heat extraction
(c) Overcools food stuff (d) Partially blocks refrigerant flow

4. The refrigerant at the suction side of the compressor must be
(a) In liquid form
(b) A mixture of vapour and liquid
(C) Super-heated vapour form
(d) Dry saturated liquid form

5. A hermetic compressor

a. Has motor and compressor in two separated enclosures
b. Has motor and compressor in one enclosure
c. Can be repaired on board
d. None of these

6. COP of refrigerator ----- with decrease in the evaporator pressure in a vapour compression system
(a) Increase
(b) Decrease
(c) Remains Same
(d) Increases and then Decreases

7. The purpose of employing a multi-circuit evaporator is
(a) Reduce pressure loss
(b) Preventing excess superheat
(c) Increase COP
(d) all of these

8. In conventional refrigerants what is the element responsible for ozone depletion?
(a) Chlorine (b) Fluorine (c) Carbon (d) Hydrogen

9. Which of the following represents sensible cooling on the psychometric chart?
(a) Inclined line
(b) Parabolic Curve
(c) Horizontal line
(d) Vertical line

10. In winter air-conditioning, the process is
(a) Heating, humidification and cooling
(b) Heating, humidification and heating
(c) Heating, dehumidification and heating
(d) Cooling, dehumidification and heating

Section B

Five Questions of 02 Marks each

11. Define flooded evaporator and starved evaporator.
12. What is latent heat and sensible heat of refrigeration cycle?
13. Sketch and explain application of pressure - enthalpy (P-H) and temperature – entropy (T-S) curve of vapour refrigeration cycle.
14. What is One Ton of Refrigeration (1 TR), and how is it defined?
15. Explain Wet Bulb Temperature and Dry Bulb Temperature?

Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered.

16. (a) Sketch vapour compression refrigeration system and label all the components properly (4 Marks)
(b) Explain working principle and function of main components of Vapour compression refrigeration system? (6 Marks)

17. (a) What is the function of Expansion valve? List out different type of expansion valve. (5 Marks)
(b) Differentiate between an open-type compressor and a hermetic compressor. Discuss their advantages, disadvantages, and applications. (5 Marks)

18. (a) Describe in detail different methods of detecting leaks in a refrigeration system. (5 Marks)
(b) Explain different types of bulb charge in expansion valve? (5 Marks)

19. Your company is planning to change over old air conditioning plant which is having R22 refrigeration gas to R 407C gas, Prepare a step by step procedure for retrofitting of refrigerating system? (10 Marks)

20. Explain the working principle of the Ammonia-Water Vapour Absorption Refrigeration System with the help of a neat and labelled diagram. Describe the function of each component in the system. (10 Marks)

21. A vapour compression refrigerator works between 60 bar and 25 bar pressure limits. The working fluid is just dry at the end of compression, and there is no under cooling of the liquid before the expansion valve. The properties of the refrigerant are given in Table 1. Determine: (a) Coefficient of performance (COP) of the cycle; and (b) Capacity of the refrigerator (in TR) if the fluid flow is at the rate of 5 kg/min. (5+5 Marks)

The properties of the refrigerant are given in Table 1

Pressure (bar)	Saturated Temperature (K)	Enthalpy (kJ/kg)		Entropy (kJ/kg K)	
		Liquid	Vapour	Liquid	Vapour
60	295	151.96	293.29	0.554	1.0332
25	261	56.32	322.58	0.226	1.2464

22. (a) Sketch and describe working of Air handling unit? (6 Marks)
(b) Explain heating with humidification and cooling with dehumidification process? (4 Marks)