

Indian Maritime University
(A Central University, Govt of India)
Supplementary Examinations – March/April 2024
Programme Name: B Tech (ME)
Semester: IV
Subject Code: UG11T4408
Subject Name: REFRIGERATION AND AIR CONDITIONING

Date: 23.03.2024

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) Air Properties data book can be used.

Section A

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

1. Which is the desirable physical property of refrigerant
(a) Toxic (b) Explosive (c) Low boiling point (d) High Freezing point
2. 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
3. Liquid refrigerant should always be charged ----- the compressor
(a) Before (b) After
(c) Anywhere (d) Both before and after
4. Air circulating diffusers have to be placed at ----- for circulating hot air into the room
(a) Near the ground level (b) Near the roof
(c) On the side walls (d) Anywhere
5. Heat anticipator in the thermostat cutoff the heating element
(a) After sufficient temperature has reached (b) After overheating room
(c) Prematurely before reaching the set temperature (d) None

6. What is the relation between DBT and WBT if the relative humidity is 100%?

- (a) DBT = WBT
- (b) DBT > WBT
- (c) DBT \gg WBT
- (d) DBT < WBT

7. Which type of compressors can be serviceable

- (a) Hermetic
- (b) Semi-Hermetic
- (c) Both
- (d) None

8. Halide detectors cannot be used to detect

- (a) CFC
- (b) HCFC
- (c) HFC
- (d) None

9. 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

10. The purpose of employing a multi-circuit evaporator is

- (a) Reduce pressure loss
- (b) Preventing excess superheat
- (c) Both (a) and (b)
- (d) None

Section B

Five Questions of 02 Marks each

11. Define evacuation.

12. Define and differentiate active and passive recovery techniques.

13. How will (a) the specific humidity and (b) the relative humidity of the air contained in a well-sealed room change as it is heated?

14. Define flooded evaporator and starved evaporator.

15. Draw a pressure - enthalpy diagram representing the refrigeration process?

Section C

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

16. A 5-m x 5-m x 3-m room contains air at 25°C and 100 kPa at a relative humidity of 75 percent. Determine (a) the partial pressure of dry air, (b) the specific humidity, (c) the enthalpy per unit mass of the dry air. (3+3+4 Marks)
(For water at 25°C, $T_{\text{sat}} = 3.1698$ kPa; $h_g = 2546.5$ kJ/kg; $h_f = 104.83$ kJ/kg)

17. Discuss the design and working of the following TXV components - the diaphragm, needle and seat, the spring, the sensing bulb, and transmission tube with a suitable sketch. (2+2+2+2+2 Marks)

18. Discuss the internal and external defrosting techniques. (5+5 Marks)

19. Discuss the vapor absorption (Ammonia) refrigeration system with the help of a relevant sketch.

20. (a) How is the liquid refrigerant added to the refrigeration system when the system is out of refrigerant? (05 marks)

(b) Explain about oil pressure safety controls. What are the advantages of using an electronic oil safety controller over a mechanical safety controller? (05 marks)

21. Explain how the TXV response to the load changes with the appropriate figures.

22. Discuss the testing procedure for the (a) pressure dependent leaks (b) temperature dependent leaks. (5+5 Marks)

