Indian Maritime University

(A Central University, Govt of India)

Supplementary Examinations – September/October 2024

Programme Name: B. Tech (Marine Engineering)

Semester: IV

Subject Code: UG11T4408

Subject Name: REFRIGERATION AND AIR CONDITIONING

Date: 10.10.2024	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) Steam tables and Refrigeration & Air-Conditioning Data Tables are allowed.
(iv) Psychrometric Charts are permitted

Section A

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

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

   (a) DBT = WBT

   (b) DBT > WBT

   (c) DBT ≫ WBT

   (d) DBT < WBT

2. Despite being a toxic gas most people use ammonia in their homes and the business because------

   (a) Ammonia is very cheap

   (b) The amount of ammonia used is very less in homes and business so it's not hazardous at all if it leaks

   (c) Ammonia is diluted with significant amount of water and is not used in the pure form in homes and business.

(d) None of the above

3. The ratio of Heat Absorbed by the refrigerant while passing through the evaporator to the Work Output required to compress the refrigerant in the compressor is termed as

(a) Efficiency of Refrigeration System

(b) Efficacy of the Refrigerant

(c) COP

(d) Performance Point

4. The practical unit of refrigeration "1-TR is the amount of heat removed from one ton of water at 0°C to become ice in

(a) 1 hour

(b) 12 hours

(c) 8 hours

(d) 24 hours

5. Which is the desirable physical property of refrigerant

(a) Toxic

(b) Explosive

(c) Low boiling point

(d) High Freezing point

6. Sensible heating is required for

(a) vaporise water into steam

(b) increase the temperature of liquid or vapour

(c) convert water into steam and superheat it

(d) measuring dew point temperature

7. The halide torch is used for _____

(a) Defrosting of the cooling coil

(b) Detecting leakage of the refrigerant

(c) Superheating the vapour refrigerant

(d) Facilitating better lubrication in the refrigerator

8. During a refrigeration cycle, heat is rejected by the refrigerant in a _____

(a) Condenser

(b) Compressor

(c) Evaporator

(d) Expansion Valve

9. 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

10. Which of the following represents sensible cooling on the psychometric chart?

(a) Inclined line

(b) Parabolic Curve

(c) Horizontal line

(d) Vertical line

Section B

Five Questions of 02 Marks each

11. Define a) Dry bulb temperature b) Wet bulb temperature
12. Explain evaporative cooling in brief.
13. Write in brief about defrosting and what are methods for conducting defrosting.
14. In case of refrigerant retrofitting explain why the baseline data is collected before retrofitting?
15. Explain (in brief) the objective of refrigeration and air conditioning on ships.

Section C

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

16. An air-water vapour mixture enters an adiabatic saturator at 30^0C and leaves at 20^0C, which is the adiabatic saturation temperature. The pressure remains constant at 100 kPa. Determine the relative humidity and the humidity ratio of the inlet mixture.

17. a) Explain the following process in detail and also illustrate on psychometric chart:

    i) Heating with Humidification ii) Cooling with dehumidification

    b) Explain system Evacuation. Mention the major problems created due to residual gases in the system.

    (05 marks + 05 marks)

18. 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)

19. Describe in detail three different methods of detecting leaks in a refrigeration system. (10 Marks)

20. a) What are the desirable properties of refrigerant for use in ships?

    b) Explain thermostatic expansion valve and their components.

    (05 marks + 05 marks)

21. Explain the refrigerant cycle by illustrating it on the P-h diagram

22. (a) What is the function of Expansion valve? List out different type of expansion valve. (5 Marks)
    (b) Explain the working principle of thermostatic expansion valve with a neat ketch. (5 Marks)