UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 5 Examination in Engineering: May 2023

Module Number: MN 5306 **Module Name: Marine Refrigeration and Air Conditioning**

[Three Hours]

[Answer **Five Questions** only, each question carries **20** marks.]

Instructions:

1. Start your answers to each question on a fresh page.
2. Clear labelled sketches will be given credits. Standard marine colour code including red colour is allowed.

Q1 (a) Prepare a list of thermodynamic, chemical and physical properties that a good refrigerant should possess.

[06 Marks]

(b) Sketch and describe the typical provision room circuit for multi-room temperature operation.

[08 Marks]

(c) State methods of cooling used in preserving dead and live cargos depending on the location of the evaporator in the ship.

[06 Marks]

Q2 (a) With reference to refrigeration plants

(i) State pumping down procedure of a compressor and occasions that it requires.

[08 Marks]

(ii) State low pressure charging procedure of a refrigerating system.

[06 Marks]

(b) Prepare a list of safety devices fitted in a refrigeration plant to comply with SOLAS requirements.

[06 Marks]

Q3 (a) State occasions that a refrigeration plant needs evacuation and dehydration and procedure applied for the same.

[08 Marks]

(b) Describe the operation of an oil separator giving a clear labeled sketch.

[06 Marks]

(c) Explain the construction and function of a Carbon Dioxide analyzer and its application in a refrigeration system.

[06 Marks]

Q4 (a) Sketch and describe a single duct air conditioning plant fitted to a cargo ship.

[08 Marks]

(b) Draw a skeleton of a Psychrometric chart to show lines and curves representing Constant Dry bulb/wet bulb temperature, relative humidity, enthalpy, specific volume and dew point temperature, representing dry bulb temperature and humidity ratio as respective axis of the chart.

[06 Marks]

(c) Draw a chart to show Dry desiccant Dehumidification in the Air conditioning process.

[06 Marks]

Q5 (a) Draw externally equalized thermostatic expansion valve and explain its operation and application in refrigeration systems.

[08 Marks]

(b) Sketch and describe the construction details of a hermetically sealed type compressor and explain the advantages of this type of construction over that of a standard type.

[06 Marks]

(c) State methods of defrosting in practice and explain the hot discharged gas defrosting used in multi temperature refrigeration systems.

[06Marks]

Q6 (a) Draw a thermostat and a solenoid operated liquid valve and explain their operation and application in refrigeration systems

[06 Marks]

(b) Sketch and describe a chilled water plant system

[08 Marks]

(c) Explain the operation of cooling towers giving suitable sketches.

[06 Marks]