UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 3 Examination in Engineering: July 2022

Module Number: MN3202 **Module Name: Fundamentals of Marine Engineering**

[Three Hours]

[Answer any Five questions]

Instructions:

1. Drawings and sketches should be clear, neat and in approximate proportion.
2. Use marine colour code for sketches and plans. Red colour is allowed only for sketches.
3. Clear labelled sketches will be given credits.
4. Start your answers to each question on a fresh page.

Q1. (a) Define the following parts of a cargo ship with suitable sketches.

Cargo holds, tank top, outer bottom, main deck, tween deck, super structure, bulbous bow, watertight bulkheads, fore end, aft end, and watertight floors.

[6 Marks]

(b) Name six types of pumps indicating in each case if it is positive displacement. What types would you use for the following services - lube oil, domestic water, main circulator boiler feed, fuel oil transfer and bilge?

[6 Marks]

(c) What is a timing diagram? Draw the timing diagram for a single acting four stroke diesel engine and explain how the timing of this engine is carried out.

[8 Marks]

Q2. (a) With reference to combustion stages of a marine diesel engines, explain the followings,

(i) physical and chemical delay

(ii) phenomena of Knocking

(iii) controlled combustion.

[6 Marks]

(b) Distinguish the difference between direct and indirect injection type diesel engines with the help of sketches.

[6 Marks]

(c) Distinguish the difference between supercharging and turbocharging processes applied to Marine Diesel Engines.

[8 Marks]

Q3 (a) With reference to crankshafts fitted to Marine Diesel Engines;

(i) State type of crankshafts and explain their construction differences in detail.

(ii) Prepare a list of causes for crankshaft deflection.

(iii) Explain the procedure employed to check the deflection of a crankshaft.

[12 Marks]

(b) List the possible causes of a crank case explosion and explain how they may be prevented.

[3 Marks]

(c) Sketch a shell and tube double pass type oil cooler and explain it.

[5 Marks]

Q4 (a) Sketch and describe the operation and construction of a Centrifugal pump used in a pumping system.

[6 Marks]

(b) Describe the necessity of a wear ring installed in a pump.

[4 Marks]

(c) Explain steps taken to balance the axial thrust of a centrifugal pump

[4 Marks]

(d) Make a line diagram of a bilge pumping system for a dry cargo ship and explain its principal of operation.

[6 Marks]

Q5 (a) Describe the operation of a plate type heat exchanger with suitable sketches. State the advantages and disadvantages of this design compared to the tubular type.

[7 Marks]

(b) Explain the back flushing system applied to regular maintenance of plate heat exchangers.

[6 Marks]

(c) With suitable sketches describe the flow and plate arrangement of "A". "B", and "Starter" plates of a plate pack.

[7 Marks]

Q6 (a) Sketch and describe a waste heat recovery evaporation plant using main engine jacket water as the heating medium.

[6 Marks]

(b) Distinguish the difference between boiling and flash evaporation.

[4 Marks]

(c) What are the advantages of a multiple effect boiling type evaporator?

[4 Marks]

(d) Sketch and describe a multi-stage flash type evaporator integrated with a salinometer and a three way dump valve.

[6 Marks]