UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 5 Examination in Engineering: February 2024

Module Number: MN 5302 **Module Name: Engineering Knowledge (Motor) I**

[Three Hours]

[Answer Five Questions only, each question carries 14 marks]

Instructions:

1. Start your answers to each question on a fresh page.
2. Drawings and sketches should be clear, neat and in approximate proportion.
3. Do not use red ink.

Q1 (a) Draw the crank angle vs. pressure diagram for a compression ignition engine and mark the following points on the diagram;

- Beginning of injection
- Start of ignition
- Completion of uncontrolled combustion/start of controlled combustion
- Completion of injection

[04 Marks]

(b) Explain the three phases of combustion.

[06 Marks]

(c) Name four undesirable elements that can be present in residual fuel oil and mention the effect of each element on the engine.

[04 Marks]

Q2 (a) Draw a simple sketch of a large 2-stroke crosshead type engine, showing important structural components.

[04 Marks]

(b) Explain five important functions of a bedplate.

[05 Marks]

(c) Describe five types of forces acting on a bedplate.

[05 Marks]

Q3 (a) Draw a cross-section of a plunger and barrel arrangement of a jerk-type fuel injection pump, including the toothed rack and pinion arrangement.

[04 Marks]

(b) With the aid of a diagram explain how the end of the injection can be achieved hence the delivering fuel quantity could be controlled. (You may draw multiple diagrams to support your explanation)

[06 Marks]

(c) Briefly explain the working principle of a fuel injector.

[04 Marks]

Q4 (a) Draw a typical cooling water system suitable for the Main Engine of a ship and name the important components.

[08 Marks]

(b) Briefly explain the function of two critical components in the system that you have drawn in above (a).

[02 Marks]

(c) Briefly explain four issues related to such a cooling system.

[04 Marks]

Q5 With respect to the piston rod stuffing boxes incorporated in two-stroke crosshead diesel engines;

(a) Draw a cross-section labelling the components.

[07 Marks]

(b) Explain the construction and function of a stuffing box.

[07 Marks]

Q6 With reference to a crankcase explosion of a diesel engine;

(a) State the reasons that can lead to such a situation.

[02 Marks]

(b) Explain the mechanics and consequences of such accidents.

[08 Marks]

(c) With the aid of a sketch, briefly explain a safety device fitted to the engine to minimize damages in such a situation.

[04 Marks]