



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 3 Examination in Engineering: March 2026

**Module Number: MN3303 Module Name: Engineering Knowledge (Motor) - I
(C-23)**

[Three Hours]

[Answer any Five questions only, each question carries 14 Marks]

This question paper contains Seven (07) questions in Three (03) pages.

[Provide sketches where necessary, make reasonable assumption and state them clearly]

Q1. With reference to engines:

- a) Briefly explain the meaning of an internal combustion engine.
[03 Marks]
- b) State the two main types of internal combustion engines categorized according to the ignition system.
[02 Marks]
- c) What are the three types of engines categorized according to their r.p.m. (speed)?
[03 Marks]
- d) State two types of marine engines according to the running gear.
[02 Marks]
- e) State two types of engines according to the air supply for combustion.
[02 Marks]
- f) Briefly explain the main difference between two-stroke and four-stroke engines.
[02 Marks]

Q2. With reference to combustion of fuel in engines:

- a) What are the two main types of fuels used in ships?
[02 Marks]
- b) Briefly explain the meaning of IFO 380 cSt fuel oil.
[02 Marks]
- c) What are the main combustible elements present in marine fuel oil?
[03 Marks]
- d) Write the combustion equations for Carbon and Hydrogen.
[02 Marks]

- e) What are the essential factors required for good combustion of fuel oil in large two-stroke engines?

[05 Marks]

Q3. With reference to engine air supply and scavenging:

- a) Briefly explain the meaning of scavenging.

[02 Marks]

- b) State three different scavenging systems used in large two-stroke engines.

[03 Marks]

- c) State the necessary steps required for the power stroke.

[02 Marks]

- d) State the main difference between a naturally aspirated engine and a supercharged engine.

[02 Marks]

- e) List the methods of supercharging used in marine engines.

[05 Marks]

Q4. With reference to engine performance:

- a) State the parameters to be checked to confirm engine performance.

[02 Marks]

- b) State the formula used to calculate indicated power in a slow-speed diesel engine.

[04 Marks]

- c) Briefly explain the method of calculating indicated power in a marine slow-speed engine using indicator (power) cards.

[06 Marks]

- d) State the formula for mechanical efficiency of an engine.

[02 Marks]

Q5. With reference to combustion of fuel oil:

- a) What are the three molecules present in marine fuel oil?

[03 Marks]

- b) State the quality measuring parameter for diesel and IFO or HFO.

[04 Marks]

- c) What is the relation between quality of fuel and its density?

[02 Marks]

- d) Briefly explain the meaning of calorific value of fuel.

[02 Marks]

e) What is the relation between calorific value and weight of fuel?

[03 Marks]

Q6. With reference to fuel oil injectors:

a) Sketch a fuel injector and label all the main parts.

[06 Marks]

b) Briefly explain the functions of a fuel injector.

[03 Marks]

c) What are the factors directly involved in the injection of fuel in fuel injectors?

[05 Marks]

Q7. With reference to fuel oil used on board ships:

a) State the effects of the following impurities in residual fuel oil on a ship's machinery plant:

i. Sulphur

[02 Marks]

ii. Vanadium and Sodium

[04 Marks]

iii. Water

[02 Marks]

b) State how each of the above effects can be countered.

[06 Marks]