



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 3 Examination in Engineering: March 2026

**Module Number: MN3302 Module Name: Engineering Knowledge (General) - 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 assumptions and state them clearly]

Q1. With reference to materials:

- a) Materials used for hull and machinery are subjected to stress and strain during service.
 - i. State three types of stresses. [06 Marks]
 - ii. State two types of strain. [04 Marks]
- b) Briefly explain Hooke's Law. [02 Marks]
- c) State the relationship between Hooke's Law and Young's Modulus (E). [02 Marks]

Q2. With reference to ship vibrations:

- a) What are the main sources of ship vibrations? [04 Marks]
- b) List the effects of ship vibrations. [04 Marks]
- c) Explain the terms "Natural frequency" and "Forcing frequency" of a ship. [02 Marks]
- d) Briefly explain the critical RPM (barred speed range) of the main engine. [04 Marks]

Q3. With reference to steel:

- a) What are the main constituents of steel?
[02 Marks]
- b) Name the different types of steel according to their carbon percentage.
[03 Marks]
- c) Briefly explain the meaning of heat treatment.
[03 Marks]
- d) Briefly explain three methods of heat treatments.
[06 Marks]

Q4. With reference to metal corrosion:

- a) Briefly explain, in your own words, what you understand by metal corrosion and metal erosion.
[02 Marks]
- b) List the different types of metal corrosion.
[06 Marks]
- c) State three methods of corrosion protection used on ship hulls.
[06 Marks]

Q5. With reference to Rotodynamic pumps:

- a) Sketch and describe a centrifugal pump.
[08 Marks]
- b) Briefly explain why a priming unit is essential for a centrifugal bilge pump.
[02 Marks]
- c) Give two advantages and two disadvantages of a centrifugal pump compared with a positive displacement pump.
[04 Marks]

Q6. With reference to shell-and-tube type heat exchangers:

- a) State three methods used to accommodate expansion between tubes and the shell.
[03 Marks]
- b) Draw a detailed sketch of one expansion arrangement.
[07 Marks]
- c) How is corrosion controlled in heat exchangers?
[02 Marks]
- d) Which type of flow improves heat transfer in heat exchangers?
[02 Marks]

Q7. With reference to metal alloys:

a) What do you understand by alloying?

[02 Marks]

b) State the constituents of the following alloys:

i. Brass

[02 Marks]

ii. Stainless Steel

[02 Marks]

iii. Bronze

[02 Marks]

c) State the physical properties and uses of bronze and stainless steel.

[06 Marks]