UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 6 Examination in Engineering: May 2026

Module Number: MN6205

Module Name: Marine Engineering Instrumentation and Control Systems – II (C-18)

[Three Hours]

[Answer **All questions**, each question carries **fourteen marks**]

This question paper contains five (5) questions in 3 pages.

Provide neat sketches where necessary, make reasonable assumptions and state them clearly.

Q1 Measurement systems are in different means and methods due to the media of which the particular measurement is to be taken. They used many different concepts for making them more suitable for various applications.

a) A thermocouple is a sensor that measures temperature. Sketch a "Thermocouple" and explain its construction and the working principle.

[4.0 Marks]

b) Describe 4 considerations to choose the best suitable "Thermocouple" for an application.

[4.0 Marks]

c) Sheathed thermocouple probes are available with one of three junction types. Mention them and explain briefly.

[6.0 Marks]

Q2 Applications of Photoelectric cell are in many ways.

a) Briefly explain such application in "Oil in water monitoring system" in merchant ships. Explain the typical system diagram with a neat sketch.

[6.0 Marks]

b) There are two methods of oil mist detection, Obscuration and Light Scatter. Sketch and describe in brief the obscuration method in an oil mist detector.

[4.0 Marks]

c) In the obscuration method, a fan is utilized. Mention 02 of its functions.

[4.0 Marks]

Q3 Detection of nature of different parameters are utmost important.

a) Detection of explosive conditions are very much important as it can cause a fire. Sketch and briefly explain an "Explosive gas detector" and its operational principle.

[6.0 Marks]

b) Explain briefly the property of "Piezoelectric material".

[4.0 Marks]

c) Explain 04 types of oxygen sensors.

[4.0 Marks]

Q4 Pressure measurements are taken with the use of instruments which uses specific concepts based on the media.

a) Sketch and briefly explain "Diaphragm-sealed pressure gauge".

[6.0 Marks]

b) Applications of a diaphragm-sealed pressure gauge can be found in different liquid conditions. Mention 02 such liquid conditions and their effects.

[4.0 Marks]

c) Explain 04 applications of a strain gauge.

[4.0 Marks]

Q5 Study of PLC and advanced technologies drive new innovations on many industry sectors to improve productivity and efficiency.

a) What does "SCADA" stand for? Briefly explain the function of SCADA.

[3.0 Marks]

b) Explain briefly quantization and sampled-data signal.

[2.0 Marks]

c) Explain briefly the counters; UP counter, Down counter and Up-Down counter.

[3.0 Marks]

d) Name 04 SCADA development packages available in the market.

[2.0 Marks]

e) Discuss 04 points to consider for the designing of a control system.

[4.0 Marks]