

The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Mechanical Engineering



Study Programme : Bachelor of Science Honours in Engineering
Name of the Examination : Final Examination
Course Code and Title : DMX7305 Renewable Sources of Energy
Academic Year : 2024/25
Date : 23rd February 2026
Time : 1330-1630h
Duration : **3 hours**

General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Five (5)** questions in **Two (3)** pages.
3. Answer **all** questions.
4. All questions carry equal marks.
5. Answer for each question should commence from a new page.
6. This is a Closed Book Test (CBT).
7. Answers should be in clear handwriting.

Question-1 (20 marks)

- a) Distinguish between primary energy, delivered energy, and useful (end-use) energy, giving one example for each. 04 marks
- b) i. Discuss the importance of energy conservation and energy management as short-term options for addressing the present energy problem. 08 marks
- ii. Explain how energy-wasting systems are identified during an energy audit with reference to combustion systems, boilers and furnaces.
- c) Analyze global energy demand trends and the implications of fossil fuel depletion for developing countries such as Sri Lanka. Discuss the role of renewable energy sources in ensuring long-term energy security and sustainable development. 08 marks

Question-2 (20 marks)

- a) Identify four major categories of biomass resources used for energy production and briefly state one characteristic of each. 04 marks

- b) Explain the principles of thermochemical and biochemical biomass conversion processes and compare their suitability for different types of biomass feedstock. 08 marks
- c) Describe the commonly used biogas production system in rural applications and discuss its technical, environmental, and socio-economic benefits in developing countries such as Sri Lanka. 08 marks

Question-3 (20 marks)

- a) Define solar constant and explain two factors that influence the amount of solar radiation received at the earth's surface. 04 marks
- b)
 - i. Explain the working principle of a photovoltaic (PV) cell.
 - ii. Discuss the electrical characteristics of solar cells, including current-voltage relationship and factors affecting efficiency. 08 marks
- c) Discuss the technical and economic considerations in designing a practical grid-connected or stand-alone photovoltaic system for Sri Lankan conditions, including system components, performance factors, and operational challenges. 08 marks

Question-4 (20 marks)

- a) Explain the different forms of ocean energy based on their energy source (thermal and mechanical), and briefly describe how energy is extracted from any two forms. 03 marks
- b) What is meant by a Wave Energy Converter (WEC)?
Briefly explain one specific type of WECs with its operation principle. 05 marks
- c) Discuss the potential of ocean energy development in Sri Lanka, considering wave resource characteristics, tidal potential, and OTEC feasibility. 05 marks
- d) Discuss the need for establishing an Ocean Energy Test Centre in Sri Lanka, highlighting technical, policy, and investment requirements for successful implementation. 07 marks

Question-5 (20 marks)

- a) Explain the concept of head and flow rate in hydropower generation and discuss how these parameters determine the power output of a hydropower plant. 06 marks

- b) Classify hydropower plants in Sri Lanka as run-of-river and storage (reservoir-based) systems, and describe their operational characteristics and typical applications. 07 marks
- c) Discuss the role of hydropower in Sri Lanka's future energy mix, considering small hydropower development, climate variability, environmental constraints, and grid stability requirements. 07 marks

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