

The Open University of Sri Lanka
Faculty of Engineering Technology



Study Programme	: Bachelor of Technology Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	: DMX7305 Renewable Sources of Energy
Academic Year	: 2023/24
Date	: 02 nd March 2025
Time	: 0930-1230h
Duration	: 3 hours

General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Five (5)** questions in **Three (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.
8. Take acceleration due to gravity and the density of water as 9.81 N/kg and 1000 kg/m³ respectively.

Question-1 (20 marks)

- a) Classify energy sources into its main forms and provide examples of each. 04 marks
- b) List the basic steps involved in systematic energy management and conservation. 08 marks
- Briefly explain how the identification of energy-wasting systems and the implementation of energy conservation measures can lead to reduced energy expenditure and increased production gains.
- c) What impact did the global energy crisis of the early 1970s have on the Sri Lankan economy? 08 marks
- Briefly explain with reference to the present scenario of the country's energy needs.

Question-2 (20 marks)

- a) Name four sources of 'Biomass' available for energy production. 02 marks
- b) Discuss the 'disadvantages' of raw biomass as a fuel and explain how these challenges can be addressed through the conversion of biomass into gaseous or liquid fuels. 06 marks
- c) Briefly explain the mechanism of 'Anaerobic Digestion' using an appropriate block diagram. 06 marks
- d) Discuss the role of biomass energy in meeting rural energy needs in developing countries like Sri Lanka. 06 marks
- How can technological advancements and policy measures contribute to the effective and efficient use of biomass energy while addressing socio-economic and environmental challenges?

Question-3 (20 marks)

- a) Differentiate between 'active solar systems' and 'passive solar systems', providing examples of each. 04 marks
- b) What are the key factors to consider when designing a solar thermal system? 08 marks
- Discuss the importance of climatic data, quality of energy produced, and properties of collector materials in the design process.
- c) What challenges did Sri Lanka face in integrating solar energy into the national grid, leading to the recent power blackout? 08 marks
- Discuss potential solutions to enhance grid stability while increasing solar energy adoption.
- Your answer should consider aspects such as energy storage solutions, grid modernization, regulatory measures, and demand-side management strategies.

Question-4 (20 marks)

- a) Name types of energy forms found in the ocean that can be utilized for power generation? 03 marks
- b) What is meant by a Wave Energy Converter (WEC)? 05 marks
- Briefly explain one specific type of WECs with its operation principle.

- c) How do wave energy technologies compare to tidal and ocean thermal energy conversion (OTEC) systems in terms of global adoption, efficiency, and environmental impact? 05 marks

Discuss key challenges and advancements in each sector.

- d) What are the major environmental and socio-economic impacts of large-scale wave and tidal energy projects worldwide? 07 marks
- Provide examples of successful implementations and the strategies used to mitigate negative effects.

Question-5 (20 marks)

- a) Explain the principle of hydro power generation and describe the typical components of a hydroelectric plant. Use diagram to clarify your answer. 06 marks
- b) Differentiate between **impulse turbines** and **reaction turbines**, explaining their working principles and typical applications. 06 marks
- c) What are the economic and social costs associated with hydropower, and how do they compare to its advantages in the context of Sri Lanka's hydropower development? Provide a balanced analysis considering environmental, economic, and community impacts. 08 marks

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