0043

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	:	**DMX6302 Energy Environment and Sustainability**
Academic Year	:	2024/2025
Date	:	24th January 2026
Time	:	13:30 to 16:30
Duration	:	3 hours

Index No. : ..... Examination Type: Closed Book Test

General instructions

1. Answer all questions.
2. Please remember to write your index number in the space provided above and in the answer script. **Do not write your name.**
3. In case of doubt, consult the supervisor or an invigilator conducting the examination.
4. This paper consists of five questions in two Pages

Question 01

a. Explain the possible pathways that a developing country could adopt to reduce the reliance on imported fossil fuel based energy. **(08 marks)**

b. Oxides of Nitrogen, Sulphur and Carbon are major compounds that pollute the atmosphere. Explain their formation, effects, and mitigation strategies. **(12 marks)**

Question 02

a. Direct combustion of Coal is still considered as a viable energy source for power generation. List and explain three main direct coal burning systems used in power stations. **(20 marks)**

Question 03

a. Biomass is a natural source of energy. List and explain six advantages and six disadvantages of using biomass as a source of energy **(20 marks)**

Question 04

a. Hydro power and wave energy are considered as green, environment friendly renewable sources of energy. However, each system has its own advantages and disadvantages. Discuss the advantages and disadvantages of each energy source. **(12 marks)**

b. Explain the effect of biofuels on sustainability, taking into consideration the raw materials, processing, and usage. **(08 marks)**

Question 05

a. Briefly explain the broad concept of life cycle assessment. **(04 marks)**

b. As per the Phases of LCA ISO 14040 Framework, the life cycle assessment can be sub divided into broad four phases as Goal and Scope Definition, Life Cycle Inventory (LCI), Life Cycle Impact Assessment (LCIA), and Interpretation. The following information is given to you with regard to a lifecycle assessment comparison of a paper cup and a plastic cup. The paper cups are made from bleached wood pulp, while the polystyrene cups are essentially made using hydrocarbons (eg. oil and gas). The paper may be considered as degradable in a landfill whereas the polystyrene is not. Electricity is used to produce steam, which is used in both manufacturing processes. Cooling water is also used by both processes. Some of the inputs and utilities used in making both the paper and polystyrene cups are given below.

Item	Paper cup	Polystyrene cup
Finished weight (g)	12	1.8
Ra material		
Wood/bark (g)	35	0
Hydrocarbons (oil/gas) (g)	4.5	4
Other chemicals (non recoverable) (g)	2.0	0.05
Steam (units)	10	1
Electricity (units)	40	2
Cooling water (units)	2	1
Waste produced (units)	450	1

Develop a list of issues that should be considered in a life cycle assessment of the two products and define the scope of the assessment. **(06 marks)**

c. Carry out a Life Cycle Assessment (LCA) as an aid for deciding which type of cup to be used in a fast-food outlet. **(10 marks)**

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End.