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

036

Study Programme	:	Bachelor of Technology Honours in Engineering
Name of the Examination	:	Final Examination
Course Code and Title	:	**DMX6302 Energy, Environment and Sustainability**
Academic Year	:	2021/2022
Date	:	28.02.2023
Time	:	1330-1630 hrs
Duration	:	3 hours

General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of 07 questions and 03pages.
3. **Answer any 05 questions only.** All questions carry equal marks.
4. Answer for each question should commence from a new page.
5. This is a Closed Book Test (CBT).
6. Answers should be in clear handwriting.
7. Do not use red colour pen.

Q1 (a) Describe in brief evolution of the types of energy conversion.

(b) What are the short-term energy policy issues?

(c) Name the four processes of energy conversion and describe one of them in detail.

(d) What are the major environmental aspects of thermal power generation?

(e) Describe the term "particulate matter" with respect to pollution due to power generation.

Q2. (a) What are the primary aims of boiler control?

(b) Why flue gas analysis is important in boilers?

(c) Give five energy saving techniques used in cooking.

(d) Characteristics of coal are based on certain factors. What are they?

(e) What are the types of coal used as a source of energy?

(e) Describe the process of coal gasification.

(f) Differentiate Syngas from Synfuels.

Q3.

(a) What are the biggest advantages of fossil fuels?

(b) What are the four major applications of Global energy?

(c) What do you mean by security of energy supply?

(d) What are the major biomass conversion processes?

(e) Name four thermo chemical biomass conversion processes. Describe which process can be used to convert biomass into a useful energy under controlled conditions of moisture, Oxygen, and temperature.

(f) What are the three main coal utilization technologies?

Q4. (a) Describe the applications of petroleum products for transport, power and Industry.

(b) State renewable energy sources which can be used as transportation fuel. Give reasons why still we depend on fossil fuel-based transportation fuel.

(c) What are the main advantages of algae which can be converted to variety of biofuels?

(d) What are the properties of natural gas? Why natural gas is more preferred in electrical power generation than biofuels?

(e) "Liquified Natural Gas (LNG) powered electrical generation is getting more popular than Dendro powered electrical power generation" Do you agree or disagree? Give advantages and disadvantages of using more LNG power plants than Dendro power plants.

Q5. Write short notes on the following.

(i) Fuel wood gasification.
(ii) Refining the petroleum products.
(iii) Petroleum products and its adverse effects to the environment.
(iv) Environmental impacts of nuclear power generation.
(v) Factors affecting the biogas production in anaerobic digester.

Q6. a) Describe the following

(i) Extra-terrestrial radiation
(ii) Irradiation
(iii) Diffuse radiation
(iv) Solar water heaters
(v) Solar cookers

b) Describe how a passive solar heating system works.

c) Name two methods to convert solar energy to electrical energy. Describe one of them with the help of schematic diagram.

d) Solar energy is available in most of the days of a year in Sri Lanka. Describe how could you make use of solar energy to solve the burning issue of power cuts in Sri Lanka.

e) Explain how a solar PV system works.

Q7. a) What are the instruments used to measure wind velocity? Describe how it works.

b) What are the main factors affecting wind speed?

c) What do you mean by Beltz limit of a wind turbine?

d) What are the adverse effects of wind turbines compared to other sources of renewable energy?

e) Determine the maximum theoretical amount of power that can be extracted by a horizontal axis wind turbine with a rotor diameter of 20 m at the wind speed of 5 m/s. Density of air is given as 1.18 kg/m^3 , $P = \frac{1}{2} \rho A.V^3\eta$