



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**UNIVERSITY EXAMINATION FOR THE DEGREE IN SCIENCE IN RENEWABLE  
ENERGY TECHNOLOGY AND MANAGEMENT**

**4<sup>TH</sup> YEAR 1<sup>ST</sup> SEMESTER 2024/2025 ACADEMIC YEAR**

**CENTRE: MAIN CAMPUS**

---

**COURSE CODE: TEB 1403**

**COURSE TITLE: ENERGY AND CLEANER PRODUCTION**

**EXAM VENUE: STREAM: BSc. REN ENGY TEC & MGT**

**DATE: 9/1/2025 EXAM SESSION:14-16.00 HRS**

**DURATION: 2 HOURS**

---

**Instructions**

- 1. Answer question 1 (Compulsory) and ANY other two questions**
- 2. Candidates are advised not to write on question paper**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

### QUESTION ONE (30 MARKS)

- a) Explain the concept of cleaner production and pollution control with respect to production process, product and services. **(8 Marks)**
- b) Briefly discuss the relationship between waste management hierarchy and cleaner production, mentioning the aspects of waste management that do not qualify as cleaner production aspects. **(8 Marks)**
- c) Briefly explain the expected benefits of a properly implemented cleaner productions process. **(8 Marks)**
- d) Outline the potential barriers to implement cleaner production in industries. **(6 Marks)**

### QUESTION TWO (20 MARKS)

Cleaner production assessment is applied to identify inefficient use of resources such as energy.

- a) Define clearly what cleaner production assessment refers to giving a flow chart summarizing the phases involved in a cleaner production assessment process. **(5 Marks)**
- b) For each phase provided in the flow chart in (a) above, mention the phase, clearly outline the main objective of that phase and describe one activity undertaken under that phase. **(15 Marks)**

### QUESTION THREE (20 MARKS)

- a) What are the three main aspects that make an energy source sustainable? Give three examples of sustainable energy sources. **(5 Marks)**
- b) Why do people use fossil fuels, instead of alternative fuels if alternative fuels are supposed to be better for the environment? **(5 Marks)**
- c) Explain the negative environmental impacts of coal as a source of energy. **(10 Marks)**

### QUESTION FOUR (20 MARKS)

Energy processes have several impacts associated with them which vary depending on the type of energy.

- a) Outline different forms of cleaner production practices/options and their potential benefits. **(6 Marks)**

b) Under the three main types of conventional energy sources (thermal, hydro-electric and nuclear power plants), mention and clearly explain one environmental impact in each.

**(6 Marks)**

c) Several non-conventional energy sources are available with the main types being wind, solar, geothermal, biomass and tidal power. For biomass, geothermal and wind power, outline and clearly explain one environmental impact associated with each. **(8 Marks)**

**QUESTION FIVE (20 MARKS)**

a) Considering natural gas/oil transportation and electricity transmission, discuss two environmental impacts associated with natural gas/oil transportation and two impacts associated with electricity transmission. **(8 Marks)**

b) Several power sources give out unwanted flue gases that have to be removed before being released into the atmosphere.

*i.* Name and clearly explain the four main sources of unwanted flue gases.

**(4 Marks)**

*ii.* An electrostatic precipitator is used to remove minute solid particles from flue gases. Describe the whole process with the aid of a detailed illustration.

**(8 Marks)**