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

4TH YEAR 1ST SEMESTER 2024/2025 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TEB 1407

COURSE TITLE: ENERGY AND CLIMATE CHANGE

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

DATE: 7 /1/2025 **EXAM SESSION:9-11.00 AM**

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 (COMPULSORY) (30 Marks)

a. Examine the following terms as used in energy and climate change.

i. Net zero CO_2 emissions. (2 Marks)

ii. Climate change. (1 Mark)

b. Examine and illustrate how bridging strategies proposed by the International Energy Agency (IEA) could deliver a peak in global energy-related emissions to stay below the 2°C climate limit. (10 Marks)

c. As the climate of the world warms, consumption of energy in climate-sensitive sectors is likely to change. Examine possible effects of this warming (4 Marks)

d. Examine specific actions highlighted by African leaders in the Nairobi Declaration as crucial in addressing climate change and accelerating energy transitions. (4 Marks)

e. Illustrate how climate change can affect fossil and nuclear energy production, conversion and end-user delivery (6 Marks)

f. Examine and illustrate the impact of greenhouse gas emission reduction policies on energy production and use in Kenya. (3 Marks)

QUESTION TWO (20 Marks)

a. Examine Net zero roadmap and show that the global pathway to keep 1.5℃ goal in reach is due to incorporation of significant changes to energy landscape. (10 Marks)

b. Show the role of renewable energy in addressing co-issues of climate change such as energy security, employment and sustainability goals. (4 Marks)

c. Examine and show the effect of climate variability on Renewable energy resources in Kenya. (6 Marks)

QUESTION THREE (20 Marks)

a. Examine the role of Carbon Capture, Utilization and Storage in energy transition. (12 Marks)

b. Examine policy tools and strategies that can accelerate the transformation of the existing energy system to one based predominantly on renewable energy. (8 Marks)

QUESTION FOUR (20 Marks)

a. Show how integrating increasing levels of variable renewables to curb climate change eventually requires more flexibility in the power system to maintain. (3 Marks)

b. Examine the role of renewable hydrogen in energy transition. (5 Marks)

c. Using Kaya Identity, illustrate key indicators that Kenya uses to track current energy and climate change progress and future ambition of the Paris agreement. (12 Marks)

QUESTION FIVE (20 Marks)

a. World energy demand is projected to increase by 34% by 2035 taking into account energy efficiency improvements, low-carbon energy activities and national pledges towards 2015 Paris Agreement. As much as there are more than enough energy resources to meet this growing energy demand, examine and show key challenges that still exists. (6 Marks)
b. Examine the characteristics of climate system components. (5 Marks)
c. The dashed lines in figure 2 below illustrates connections between climate change and energy production and use. Examine and show these connections using relevant examples. (9 Marks)

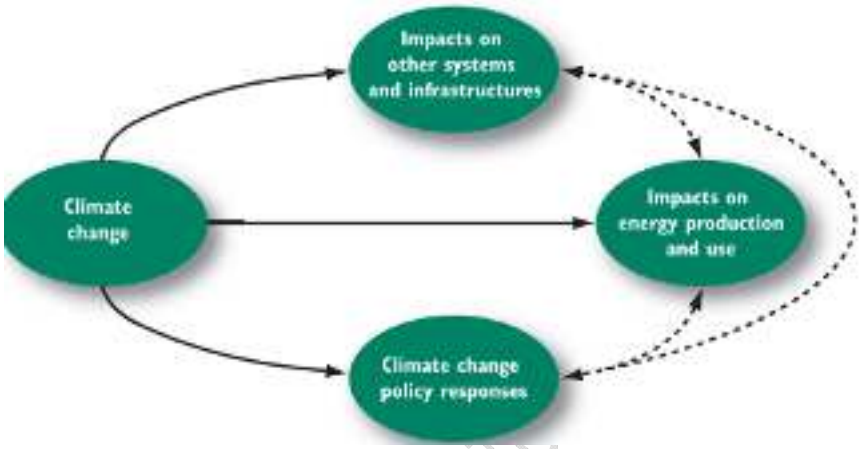

Figure 1. Dashed lines shows connection between climate change and energy production and use.