



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 2ND SEMESTER 2023/2024 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TEB 1402

COURSE TITLE: ENERGY TRADE

EXAM VENUE:

STREAM: BSc. REN ENGY TEC & MGT

DATE: /04/2024

EXAM SESSION:

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. Define the following terms:
 - i. Energy derivative. (1 Mark)
 - ii. Stochastic process. (1 Mark)
 - iii. Financial forward contract. (1 Mark)
 - iv. Emissions trading. (1 Mark)
- b. Principles of emissions trading scheme include Cap Allowances, Trade and Compliance. Demonstrate how National Environment Management Authority (NEMA) will apply on electricity generation facilities in Kenya. (6 Marks)
- c. Examine key features of unbundling electricity markets in Africa.(6 Marks)
- d. State the main stochastic processes used to value commodity derivatives. (3 Marks)
- e. From emissions trading perspective, demonstrate how the National Environment Management Authority can ensure a smooth and effective Cap-and-Trade scheme between Bamburi cement Limited and Mabati Rolling Mills. (5 Marks)
- f. Kyoto protocol established two major mechanisms, compare and contrast these mechanisms. (4 Marks)
- g. State the main properties of Random Walk process. (2 Marks)

QUESTION TWO (20 Marks)

- a. Applying the principles of additionality, leakage and double counting, show that a 100 kW solar power plant to be set up in Bondo town is eligible for carbon credits (6 Marks)
- b. The 35 MW bagasse based cogeneration project by Mumias Sugar Limited was registered under CDM on September, 2008. Demonstrate at least four different stages undertaken by Mumias Company, as a project developer, before their registration and subsequent certification or validation of the project. (4 Marks)
- c. Compare and contrast spot, forward and future markets in relation to energy markets and examine the concepts of backwardation and contango (use examples where appropriate). (10 Marks)

QUESTION THREE (20 Marks)

- a. Compute the costs of two scenarios for a buyer: buying Certified Emission Reduction (CER) today; and buying a temporary CER today and a CER in the future to replace it. Clearly state your assumptions (6 Marks)
- b. Examine two principle options by which facilities in Kenya can get emissions allowances from the government. (4 Marks)
- c. Demonstrate the pitfalls of using Geometric Brownian motion to model commodity prices in Kenya. (10 Marks)

QUESTION FOUR (20 Marks)

- a. Examine the concept of unbundling as used in electricity markets highlighting different approaches used by different nations. (5 Marks).
- b. Applying the key features of Emission Trading Scheme (ETS), design a balanced ETS that is cognizance of Kenya's government national competing goals. (7 Marks)
- c. Using examples, demonstrate how market failures results in firms and households making inefficient energy choices. (8 Marks)

QUESTION FIVE (20 Marks)

- a. Examine three unique characteristics explaining why there is no single electricity market in Kenya. (6 Marks).
- b. Examine the origin and substantial expansion of carbon markets worldwide. (4 Marks)
- c. Examine unique features of electricity spot prices in understanding a certain energy market. (6 Marks)
- d. Compare and contrast Kyoto Protocol and EU Emission Trading System (EU ETS). (4 Marks)