



**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 2<sup>ND</sup> SEMESTER 2024/2025 ACADEMIC YEAR**

**CENTRE: MAIN CAMPUS**

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**COURSE CODE: TEB 1402**

**COURSE TITLE: ENERGY TRADE**

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

**DATE: 14 /04/2025 EXAM SESSION:9-11.00 AM**

**DURATION: 2 HOURS**

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**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. Emissions trading system. (1 Mark)
  - ii. Verified emissions reduction. (1 Mark)
  - iii. Spot market. (1 Mark)
  - iv. Brent Blend. (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. (5 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. Examine the term liquefied natural gas and explain two approaches used to liquefy natural gas in large quantities. (3 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. Calculate Certified Emission Reductions (CERs) accrued from a wind power project replacing a diesel power plant. Given, wind power replaces diesel power, which emits 0.86 tCO<sub>2e</sub> per MWh; wind power generates 6500 MWh per year. 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. (5 Marks)
- d. Compare and contrast compliance and voluntary markets across the world. (5 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. Compare and contrast purchasing call options and purchasing swap contracts in Kenya. (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)