



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**

3RD YEAR 1ST SEMESTER 2024/2025 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TEB 1303

COURSE TITLE: HYDROPOWER TECHNOLOGY I

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

DATE: 8 /1/2024 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. Discuss the current world situation with respect to different energy sources and their contributions. **(8 Marks)**
- b. Briefly discuss the different basic considerations to be undertaken before making final decisions to invest in hydropower generation. **(8 Marks)**
- c. “Head” and “Flow” are two critical parameters in hydropower generation. Explain what they are, how they can be measured and used to estimate the potential or theoretical power in a river. **(8 Marks)**
- d. Due to global warming, briefly elaborate on how it has affected the economic viability of setting up HEP plant in Kenya **(6 Marks)**

QUESTION TWO (20 MARKS)

- a. With respect to hydropower technology and analysis, explain what you understand by the “Flow duration curve” and its importance. Use a sketch to show a typical curve. **(10 Marks)**
- b. Explain the following forms of analysis
 - i. The rank ordered technique **(5 Marks)**
 - ii. The class-interval technique **(5 marks)**

QUESTION THREE (20 MARKS)

With reference to a typical hydropower plant and a sketch, show and discuss the main components and their functions **(20 Marks)**

QUESTION FOUR (20 MARKS)

- a. Briefly explain the following and their importance; **(10 Marks)**
 - i. Load factor
 - ii. Capacity factor
 - iii. Utilization factor
 - iv. Load duration curve
- b. A small dam in the nearby town estimated to be 10ft high was constructed along a river with water flowing at 500 cubic feet per second. Calculate the amount of power the dam will generate. (The turbine and generator has a conversion efficiency of 80%) **(10 Marks)**

QUESTION FIVE (20 MARKS)

- a. Hydropower can be classified in different ways. Explain the operations of the hydropower plants described as below; **(10 Marks)**
 - i. Run-of-river
 - ii. Pumped storage
 - iii. Base-load plants
 - iv. Load to meet demand
- b. The average annual residential energy use in that town is about 2000 kilowatt-hour for each person. Calculate how much electric energy is produced per annum and how many people the dam could serve. State any assumptions made. **(10 Marks)**