



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

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

THIRD YEAR FIRST SEMESTER 2015/2016 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TET 3312

COURSE TITLE: HYDROPOWER TECHNOLOGIES I

EXAM VENUE: CR

STREAM: BSc RE TECH & MGT

DATE: 26/04/16

EXAM SESSION: 2.00 – 4.00 PM

TIME: 2 HOURS

Instructions to candidates

The paper contains FIVE questions.

Answer question ONE and any other TWO questions

Candidates must hand in their answer booklets to the invigilator while in the examination room.

QUESTION ONE (COMPULSORY)

- a. State the hydropower equation and define its major components. (3 marks)
- b. Discuss the differences between reaction and impulse turbine and state the advantages and disadvantages of each. (8 marks)
- c. Kisumu county assembly has proposed the setting-up of a hydro-power scheme on the outskirts of Lake Victoria. As a key stakeholder in the proposal,
 - i. Describe in detail the major components of the proposed hydropower scheme and principle behind their operations. (9 marks)
 - ii. Discuss the environmental impact of power generation and utilization from the scheme to Kisumu County and its environs. (10 marks)

QUESTION TWO

- a. In hydropower generation, turbines are key drivers of power generation. Discuss the following turbines
 - i. Kaplan turbine (3 marks)
 - ii. Francis turbine (5 marks)
- b. Using illustrations as much as possible describe two types of intake structures that may be considered when setting up a hydropower station in any of our local rivers in. (4 marks)
- c. There is no standard answer as to how much a micro-hydropower system costs as the costs depend on site conditions and on how much work you are prepared to do yourself. Discuss this statement. (8 marks)

QUESTION THREE

You have been identified as the leading expert by the Ministry of Energy & Petroleum (Kenya) to carry out a feasibility study along River Nzoia with the objective of setting up a micro-hydropower system. Discuss in details how you would determine the head and flowrate of the micro-hydropower system to be set up. (20 marks)

QUESTION FOUR

- a. Using illustration, describe the general principles of selecting an intake location of any micro-hydropower station. (4 marks)
- b. What is the purpose of spillway/spill weir in a hydropower plant (2 marks)
- c. Differentiate Peltonwheel turbine with Francis turbine. (5 marks)
- d. The Governor and county assembly members of Bondo County are proposing the setting up of a micro-hydropower system in the county. The Dean, school of engineering and technology has selected you to help the Governor and county members understand the basic components of a micro-hydropower system. Discuss (9 marks)

QUESTION FIVE

You have been appointed as the project coordinator of a micro-hydropower (MHP) installation in Bondo County. The MHP being the first of its kind in the area is funded by Okoa Kenya organization and developed by School of Engineering and Technology, JOOUST. Since the project is slated to benefit about 150 households, develop a successful case study of the MHP installation. (20 marks)