



DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY

UNIVERSITY EXAMINATIONS 2020/2021 ACADEMIC YEAR

**THIRD YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE IN CIVIL ENGINEERING , BACHELOR OF
EDUCATION TECHNOLOGY IN CIVIL ENGINEERING AND BACHELOR OF
TECHNOLOGY IN BUILDING CONSTRUCTION**

ECE 3102: HYDRAULICS I

DATE: 23RD SEPTEMBER 2021

TIME: 2:00-4:00PM

INSTRUCTIONS TO CANDIDATES

- Cell phones are **NOT** allowed in the examination room
- This paper contains **FOUR (4)** questions
- Attempt **QUESTION ONE (1)** and any other **TWO** questions
- Question one (1) carries **30 Marks** while the rest carry **20 Marks** each
- Use a scientific non-programmable calculator
- Erasers, pens and pencils will be required
- **ALL** workings **MUST** be shown on the provided answer booklets
- Carefully read and abide by the rubric on the answer booklet
- All symbols have their usual meaning unless otherwise stated

QUESTION ONE (1) (30 MARKS)

Describe the difference between the following fluid mechanics terms:

- a) Hydraulic Radius and Hydraulic Jump (5marks)
- b) Open channel and Pipe flow (5marks)
- c) Subcritical and supercritical flow (5marks)
- d) Specific energy and Specific force(5marks)
- e) Steady vs unsteady flow (5marks)
- f) Uniform flow vs non-uniform flow (5marks)

QUESTION TWO (2) (20 MARKS)

An engineer discharges water into a rectangular channel with a mean velocity of 2m/s and a depth of 1m. If the channel is 5m wide, determine:

- i) Actual flow rate (4 marks)
- ii) Specific Energy Head (4 marks)
- iii) Critical Depth (4 marks)
- iv) The maximum flow possible (4 marks)
- v) Froude's number and the type of flow regime (4 marks)

QUESTION THREE (3) (20 MARKS)

A gradually varied flow profile is classified based on the channel slope S_o and magnitude of flow depth, y , in relation to normal depth y_n and critical depth y_c . Channel bed slope S_o is classified based on the relative magnitude of the normal depth y_n and critical depth y_c . Describe the various channels' classes by populating the following table (20marks)

Channel Category	Symbol	Characteristic condition	Description
Mild Slope			
Steep Slope			
Critical Slope			
Horizontal bed			
Adverse Slope			

QUESTION FOUR (4) (20 MARKS)

A trapezoidal weir has a side slope of 4:1, a crest length of 4m, and a head of 4m. If the weir discharge coefficient is 1.86:

- (a) calculate discharge over the weir (10 marks)
- (b) Describe 2 other types of weirs and 3 types of venturi meters/flumes (10 marks)