



**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR**

THIRD YEAR SECOND SEMESTER EXAMINATION

MAIN EXAMINATION

**FOR THE DEGREE OF
BACHELOR OF SCIENCE IN DISASTER PREPAREDNESS AND
ENVIRONMENTAL TECHNOLOGY
&
BACHELOR OF SCIENCE IN DISASTER MITIGATION AND SUSTAINABLE
DEVELOPMENT**

COURSE CODE: DPE 309

**COURSE TITLE: SIMULATION & MODELING IN DISASTER
PREPAREDNESS**

DATE: 17/4/2023

TIME: 3-5 PM

INSTRUCTIONS TO CANDIDATES

This paper contains **four (4)** questions

Question **one (1)** is compulsory {total = 30 Marks}

Attempt **any other two (2)** {total = 40 Marks} from the remaining questions

Be brief and to the point

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 2 Printed Pages. Please Turn Over. 

SECTION I: COMPULSORY {30 MARKS}

Question ONE

- What is the significance of building mathematical models in the context of disaster preparedness? (10 Marks)
- Describe the primary requirement of any simulation model (10 Marks)
- Discuss the role of 'simple linear functions and equations' in disaster preparedness (10 Marks)

SECTION II: ATTEMPT ANY OTHER TWO (2) QUESTIONS {40 MARKS}

Question TWO

- How is aerial rainfall obtained using the Arithmetic Mean method? (10 Marks)
- Using relevant examples, describe the following;
 - Physical models (5 Marks)
 - Abstract models (5 Marks)

Question THREE

The measured streamflow datasets (Q_o) for ten days were obtained from the Water Resources Management Authority in Kenya. A simulation exercise was carried out and the resultant streamflow (Q_s) is as tabulated below.

Table 1 Observed streamflow (Q_o [m^3/s]) and simulated streamflow (Q_s [m^3/s]) datasets

Day	Observed streamflow (Q_o [m^3/s])	Simulated streamflow (Q_s [m^3/s])
1 st	115	111
2 nd	124	129
3 rd	204	205
4 th	233	235
5 th	212	220
6 th	220	224
7 th	195	183
8 th	154	155
9 th	123	132
10 th	112	115

Using the data on Table 1, compute the following;

- The Efficiency Index (EI) (10 Marks)
- The Root Mean Square Error (RMSE) (10 Marks)

Question FOUR

- Explain the key factors that may contribute to a model calibration inaccuracy (10 Marks)
- What do you understand by the Index of Volumetric Fit, and what is its role in modeling and simulation exercise? (10 Marks)