(Knowledge for Development)

KIBABII UNIVERSITY

(KIBU)

UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR FOUR SEMESTER ONE EXAMINATIONS

FOR THE DEGREE OF BACHELORS OF SCIENCE
(INFORMATION TECHNOLOGY)

COURSE CODE: BIT 415

COURSE TITLE: SIMULATION AND MODELING

DATE: 25/04/2023 TIME: 9.00 A.M. - 11.00 A.M. 2HRS

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO

QUESTION ONE (COMPULSORY) [30 MARKS]

a) Define Simulation and Modeling **[2 marks]**

b) Discuss four reasons for the steadily increasing interest in simulation applications **[4 marks]**

c) Give at least two uses of Simulation modeling. **[2 marks]**

d) Explain the following types of models

i. Formal versus Informal Models. **[2 marks]**

ii. Physical Models versus Abstract Models. **[2 marks]**

e) Illustrate the difference between Simple analytical models and Complex analytical models. **[2 marks]**

f) State the distinction between Black box approach and White box approach. **[2 marks]**

g) State the two key elements that make a model white-box. **[2 marks]**

h) Different models present the system from different perspectives. Explain these perspectives. **[3 marks]**

i) Define Visualization as used in simulation modeling. **[2 marks]**

j) Why are the visualization of simulations distinct from other computer graphic media? **[2 marks]**

k) What is black box testing? **[2 marks]**

l) Define Maximum Likelihood Estimation as used in simulation modeling. **[2 marks]**

m) What is a seed as used in Random Number Generator? **[1 marks]**

QUESTION TWO [20 MARKS]

a) Discuss the following software testing techniques

i. All-pairs testing **[2 marks]**

ii. Equivalence partitioning **[2 marks]**

b) MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. Illustrate the basic features of MATLAB. **[7 marks]**

c) Give the difference between true random number generators (TRNGs) and pseudo-random number generators (PRNGs). **[2 marks]**

d) Stat Trek's Random Number Generator allows Users to permit or prevent the same number from appearing more than once in the random number table. Explain the steps to permit duplicate entries and prevent duplicate entries. **[3 marks]**

e) State the four Types of Random--number Generators. **[4 marks]**

QUESTION THREE [20 MARKS]

a) What is meant by boundary value analysis in software testing? **[2 marks]**

b) What is State transition testing? **[2 marks]**

c) MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. Discuss at least two uses of MATLAB. **[2 marks]**

d) Discuss hardware random number generator (HRNG) or true random number generator (TRNG) as used in computing. **[2 marks]**

e) Random numbers are sets of digits (i.e., 0, 1, 2, 3, 4, 5, 6, 7, 8, 9) arranged in random order. Because they are randomly ordered, no individual digit can be predicted from knowledge of any other digit or group of digits. Illustrate what is meant by Random number table. **[2 marks]**

f) Stat Trek's Random Number Generator produces a listing of random numbers, based on the User specifications: state the three user specifications. **[3 marks]**

g) State Two important statistical properties of Random Numbers. **[2 marks]**

h) Illustrate the five Potential problems with deterministic generators **[5 marks]**

QUESTION FOUR [20 MARKS]

a) Discuss the following two types of testing techniques

i. Cause–effect graph **[2 marks]**

ii. Error guessing **[2 marks]**

b) Random numbers are numbers that occur in a sequence such that two conditions are met: briefly illustrate the two conditions. **[2 marks]**

c) Discuss the three desired properties of a good random number Generator **[3 marks]**

d) Define a pseudo-random number generator (PRNG). **[2 marks]**

e) Give the Difference between continuous Simulation and discrete event Simulation **[4 marks]**

f) A simulator is a device, computer program, or system that performs simulation. A simulation is a method for implementing a model over time. Explain three types of commonly used simulations. **[3 marks]**

g) Give the difference between Task Trainer Simulation. Manikin-based Simulation **[2 marks]**

QUESTION FIVE [20 MARKS]

a) Define Tissue-based Simulation. **[2 marks]**

b) If we set the minimum value equal to 12 and the maximum value equal to 30, the Random Number Generator will produce a table consisting of random arrangements of numbers in the range of 12 to 30. Discuss. **[2 marks]**

c) A system satisfies the superposition principle if two conditions are satisfied: explain the two conditions. **[2 marks]**

d) Illustrate the distinction between Use case testing and User story testing. **[4 marks]**

e) Explain the five main parts of the MATLAB system. **[10 marks]**