



# **MAASAI MARA UNIVERSITY**

**UNIVERSITY EXAMINATIONS  
2018/2019 ACADEMIC YEAR  
(REGULAR)**

**SCHOOL OF SCIENCE AND INFORMATION SCIENCES  
DEPARTMENT OF COMPUTING AND INFORMATION  
SCIENCES**

**FOURTH YEAR SECOND SEMESTER  
EXAMINATION**

**BACHELOR OF SCIENCE IN COMPUTER  
SCIENCE**

**COURSE CODE: COM 426E**

**COURSE TITLE: SIMULATION & MODELLING**

**DATE: 29<sup>TH</sup> APRIL 2019  
-1300HRS**

**TIME: 1100**

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## **INSTRUCTIONS TO CANDIDATES:**

**ANSWER ALL QUESTIONS IN SECTION A AND ANY 2 QUESTIONS IN SECTION B**

**DURATION OF THE EXAMINATION: 2 HOURS**

### **SECTION A: COMPULSORY [30 MARKS]**

#### **QUESTION ONE**

- a) Define the following terms
  - i. Simulation  
[2 marks]
  - ii. Model  
[2 marks]
  - iii. System  
[2 marks]
  - iv. Operating systems  
[2 marks]
- b) Distinguish between the following
  - i. Natural systems and Designed physical systems  
[4 marks]
  - ii. Designed abstract systems and Human activity systems  
[4 marks]
- c) Define the Monte Carlo simulation.  
[2 marks]
- d) Outline the selection process of simulation software  
[2 marks]
- e) Explain four reasons Why simulation is necessary  
[8 marks]

- f) Define the term variability  
[2 marks]

**SECTION B ATTEMPT ANY TWO QUESTIONS [40 MARKS]**  
**QUESTION TWO**

- i. Define the term Random Numbers  
[1 mark]
- ii. The design is usually documented as a set of graphical models. State any two models  
[2 Marks]
- iii. Distinguish between Dynamic complexity & Combinatorial complexity  
[4 marks]
- iv. Draw a detailed diagram of a conceptual model and explain[3 marks]
- v. Draw a detailed diagram of the three-phase simulation approach for discrete events  
[4 marks]
- vi. Explain the Basic steps in Monte Carlo Simulation  
[6 marks]

**QUESTION THREE**

- i. Define the discrete event modelling.  
[2 marks]
- ii. Define the time slicing of the simulation process  
[2 marks]
- iii. Distinguish between the following:  
a) Static simulation and Dynamic simulation  
[4 marks]
- iv. Outline one disadvantages of simulations  
[2 marks]
- v. State the important properties of random numbers  
[2 marks]
- vi. Outline the FOUR Benefits of VIS (Visual Interactive Simulation)

[4 marks]

- vii. Distinguish between the following
- a) General purpose simulation packages & Application orientated simulation packages
- [4 marks]

#### **QUESTION FOUR**

A certain airport contains a single runway on which arriving aircraft must land. Once an aircraft is cleared to land, it will use the runway, during which time no other aircraft can be cleared to land. Once the aircraft has landed, the runway is available for use by other aircraft. The landed aircraft remains on the ground for a certain period of time before departing.

1. Define a computer representation of the state of the system, i.e., define state variables that encode the current state of the physical system

[5 Marks]

2. Define a simulation program that modifies state variables to model the evolution of the physical system over time.

[5 Marks]

3. Implement the above airport problem using Discrete Event Simulation (DES).

[10 Marks]