MAIN CAMPUS **COURSE CODE: COMP 423 MAIN EXAMINATION**

UNIVERSITY OF ELDORET

SCHOOL OF SCIENCE
DEPT. OF MATHEMATICS & COMPUTER SCIENCE 0110541020

UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR, APRIL 2024

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY, BACHELOR OF COMPUTER SCIENCE, BACHELOR OF EDUCATION SCIENCE & BACHELOR OF SCIENCE IN ANALYTICAL CHEMISTRY

COURSE CODE: **COMP 423**
COURSE TITLE: **SIMULATION AND MODELLING**

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INSTRUCTION TO CANDIDATES
Answer **ALL** questions from section A and any **THREE** from section B.
Duration of the examination: **3 HOURS**

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SECTION A (Compulsory)

Question One (16 Marks) - technique used to model the behaviour of complex systems.

a) Define the term Simulation, giving an example of real-life current problems that might require use of simulations according to your problem thinking **(4 Marks)**

b) The availability of special purpose simulation languages of massive computing capabilities at a decreasing cost per operation, and advances in simulation methodologies has made simulation one of the most widely used and accepted tools in operation research and system analysis. Circumstances under which simulation is the appropriate tool to use have been discussed by several authors. Elaborate on the possible discussion by such authors. - When the system is too complex. **(12 Marks)**
- To optimize Processes * Resource planning
- Decision support * Predictive modelling.

Question 2 (15 Marks)

a. Define the following terms as used in Simulations. **(6 Marks)**

i. System - software environment for simulating.
ii. State - Current configuration, current snapshot, specific system time
iii. Event - Occurrence or action taking place in a system.

b. The application of simulations is Vast. Discuss at least **six** key areas where Simulation and modeling are used. **(9 Marks)**
- Manufacturing.
- Engineering and design
- Gaming.
- Military and defense
- Health care
- Education & training
- Transport
- Risk Mangement

Section B (Choose any Three Questions)

QUESTION THREE

(13 Marks)

a. Consider the following continuously operating job shop. Inter-arrival times of jobs are distributed as follows:

Time Between Arrivals (Hours)	*Probability*
0	.23
1	.37
2	.28
3	.12

Processing times for jobs are normally distributed with a mean of 50 minutes and standard deviation of 8 minutes. Construct a simulation table and perform a simulation of 10 new customers. Assume that, when simulation begins, there is one job being processed (Scheduled to be completed in 25 minutes) and there is one job with 50 minutes processing in the queue.

i. What was the average time in the queue for the 10 new jobs? **(5 Marks)**
ii. What was the average processing time for the 10 new jobs in the queue? **(4Marks)**
iii. What was the maximum time in the system for the 10 new jobs? **(4 Marks)**

QUESTION FOUR

(13 Marks)

a. Discrete event simulation (DES) is a method used to model real world systems that can be decomposed into a set of logically separate processes that autonomously progress through time. Discuss situations when simulation is an appropriate tool. **(10 Marks)**
– check behind.

b. Define the term Model – Representation of Real world System, Process or Phenomenon **(3Marks)**

QUESTION FIVE

(13 Marks

a) Creating a framework for spreadsheet simulation involves defining a structured approach to setting up and conducting simulations in a spreadsheet environment. Discuss the components of such a framework. check Whatsap **(5 Marks)**

b) Modeling and simulation is widely used in the social and physical sciences, engineering, manufacturing and product development, among many other areas. Discuss the Steps in Simulation study process. ✓Define objectives ✓Design experiments → Analyze results → Document & report ✓Develop a model ✓Collect Data → Validate and Verify **(8 Marks)**

QUESTION SIX

(13 Marks)

a) Discuss relevant important features when selecting simulation software. ✓Modelling Capabilities ✓User friendly ✓Data handling ✓support experiment ✓output **(5 Marks)**

b) Name several entities, attributes, activities, events and state variables for a banking system. Check behind. **(8 Marks)**

QUESTION SEVEN

(13 Marks)

a. Discuss how Random arrival time Simulation can be performed in an Excel sheet **(5 Marks)**

✓Define Arrival time
✓Generate Random arrival time.
3. Format cell as time
4. Perform Simulation.
5. Copy multiple formulas
(check your whatsap)

b. Simulating randomness in Excel can be useful for various purposes such as generating random data for testing, conducting simulations, or creating random scenarios. Excel provides several built-in functions to facilitate random number generation. Discuss at least **FOUR** methods of generating Randomness in Excel. **(8 Marks)**

(1) – RAND function – Using the = RAND()
(2) – RAND BETWEEN – Generates Random Integers between the specified bottom and top values.
(3) Random Sampling
(4) Randomizing Data
(5) Monte Carlo Simulation
(6) Random seed.

4a
- When Analytical solution Exists
- When Systems are highly Deterministic
- Lack of Data or Understanding.
- When the cost is too much / too expensive.
- When the System under ~~System~~ Study is behaviour based.
- Ethical Considerations

6B

Entities	Attributes	Activities	Events	State variable
✓ Customer	✓ Name	~~Withdrawal~~	Deposits	Account balance
✓ ~~Customer~~	✓ Address	~~Deposits~~	Withdrawals	Loan status.
✓ ACCOUNT	✓ DOB			
✓ transactions	✓ ID			
✓ LOAN				