# ATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
## FACULTY OF APPLIED SCIENCES
## DEPARTMENT OF COMPUTER SCIENCE

## SIMULATION AND MODELLING
## SCS4108

**Main Examination Paper**
**DECEMBER 2024**
**This examination paper consists of four (2) pages**

| | |
|---|---|
| Time Allowed: | 3 hours |
| Total Marks: | 100 |
| Special Requirements: | None |
| External Examiner's Name: | Dr C Gombiro |
| Examiner's Name: | Mr K R Chilumani |

**INSTRUCTIONS**

1. Answer any four (4) questions.
2. Each question carries 25 marks.
3. Use ARENA for programming questions.

**MARK ALLOCATION**

| QUESTION | MARKS |
|---|---|
| 1. | **25** |
| 2. | **25** |
| 3. | **25** |
| 4. | **25** |
| 5. | **25** |
| **TOTAL FOR FOUR QUESTIONS** | **100** |

**QUESTION ONE**

a) Distinguish between the following types of random number tests:
   i. Test for independence. [5]
   ii. Test for independence. [5]

b) Given that the seed $X_0$=31, the multiplier a=3, the increment c=15 and the mode m=M=100. Use the Linear Congruential Generator (LCG) method to generate a stream of 10 random numbers. [5]
   Hence perform the following tests:
   i. Chi-square test. [5]
   ii. Kolmogorov-Sminorv test. [5]

**QUESTION TWO**

a) Outline the principles of system theory for simulation models. [5]

b) Discuss the use of inventory simulation models. [10]

c) Discuss the use of queuing simulation models. [10]

**QUESTION THREE**

a) Explain when it is appropriate to use simulation as a decision making tool. [10]

b) Consider the processes that occur in commercial bank. Construct an ARENA simulation model. [15]

**QUESTION FOUR**

a) Develop an activity cycle diagram (ACD) from the life cycle diagrams (LCDs) of a coffee drinker simulation. [10]

b) A small grocery store has only one checkout counter. Customers arrive at this checkout counter at random from 1 to 8 minutes apart with uniform distribution. Each possible value of inter-arrival time has the same probability of occurrence ranging from 5 to 10 minutes. You are required to simulate 30 minutes of operation on an a'dhoc simulation table. [15]

**QUESTION FIVE**

Outline the thirteen (13) steps in a simulation study. [25]

**END OF QUESTION PAPER**



 