"Investing in Africa's Future"

COLLEGE OF ENGINEERING AND APPLIED SCIENCES (CEAS)

NCSC408: SIMULATION AND MODELING

END OF SECOND SEMESTER EXAMINATIONS

APRIL 2025

LECTURER: DR. TENDAI ZENGENI

TIME: 3 HOURS

INSTRUCTIONS

You are required to answer questions as instructed in each section

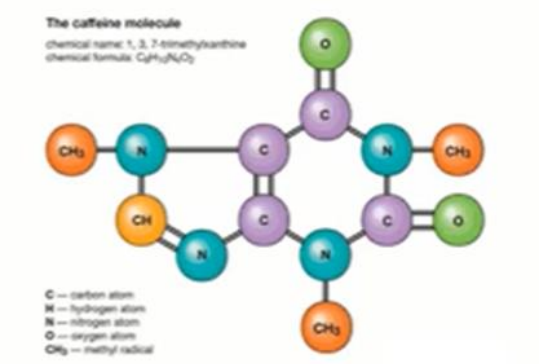
Start each question on a new page in your answer booklet

Answer 4 Questions **ONLY**

Question 1

a) With the aid of examples discuss why Simulators used. In your response also state the advantages of using simulators. (10 marks)

b) Describe this model and what it is used for. (3 marks)



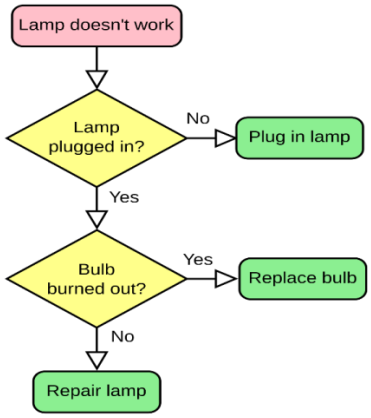
c) Give 4 examples of the Rule of Thumb. (4 marks)

d) Describe the model below. (3 marks)

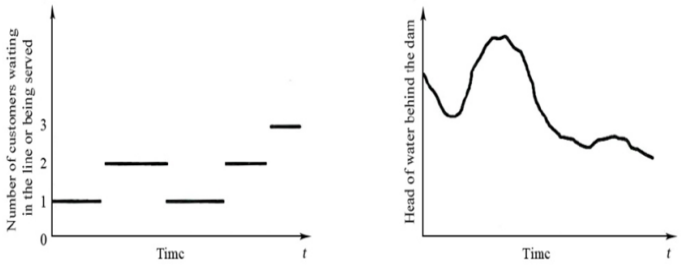
e) Describe this simulation. (5 marks)

Question 2

a) The following is a flow diagram or flowchart for a lamp which does not work. Design your own flowchart to describe the steps you take when using an ATM at the Bank. (10 marks)

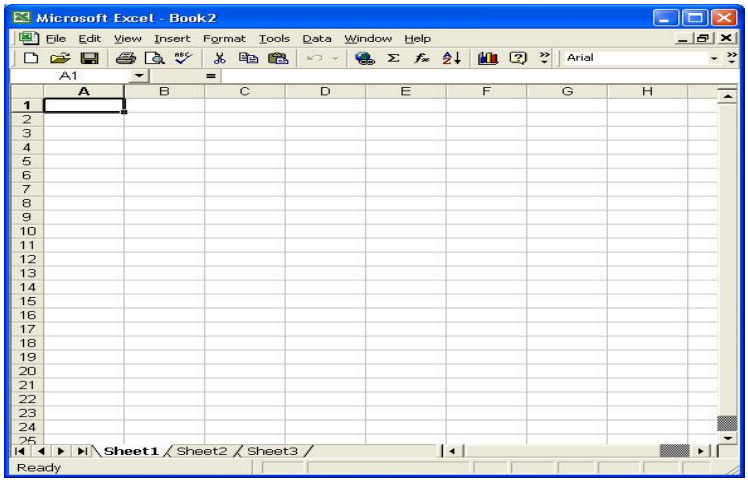


b) In diagram **A** and **B**, indicate the discrete system and continuous system and explain why they are termed as so. (5 marks)



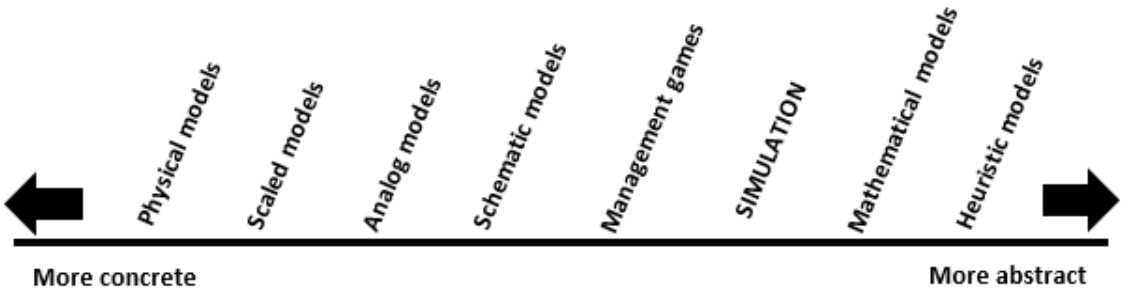
A **B**

c) Spreadsheet models can be used for what if analysis. Highlight the techniques, used with spreadsheets in order to perform simulations and how the results can be presented. You are allowed to use drawings for explanation. (10 marks)



Question 3

Models can be classified into Concrete and Abstract along a scale. Give examples and explanations of each model from the concrete to the more abstract scale. (25 marks)



Question 4

The simulation process is systematic. Using the list below and putting the processes in their correct order, describe the simulation process from the beginning until you reach the end.

a) Perform simulation and collect the results.
b) Build the model.
c) Perform an appropriate data collection.
d) Determine the goals. Setting the goal is the first step to be taken.
e) Validate the built model.
f) Analyze the results.
g) Make the final documentation. (25 marks)

Question 5

Perform a simulation of the following inventory systems given the daily demand is represented by random numbers **4,3,8,2,5** and the demand probability is

Demand	0	1	2
Probability	0.2	0.5	0.3

Demand	Probability	Cumulative probability	Random Digit Assignment
0	0.2		
1	0.5		
2	0.3		

Day	Beginning inventory	Random Digit for demand	Demand	End Inventory	Shortage

(25 marks)

Question 6

a) Discuss calibration and validation of models? Explain with practical examples (5 marks)

b) Explain the differences between static and dynamic models with examples. What are the main differences between them? (10 marks)

c) Explain Markov chains with examples and its applications. (10 marks)

Question 7

d) Give an example with explanations of these Components of a **CAR** system: (25 marks)

- An entity
- Attribute
- Activity
- State
- Event
- Endogenous
- Exogenous
- Queue

END OF EXAMINATION