(Knowledge for Development)

KIBABII UNIVERSITY
(KIBU)

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR THREE SEMESTER TWO EXAMINATIONS

FOR THE DEGREE OF
(COMPUTER SCIENCE)

COURSE CODE : CSC 366E

COURSE TITLE : SIMULATION AND MODELING

DATE: 14/10/2021 **TIME:** 02.00 P.M. – 04.00 P.M.

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

QUESTION ONE (COMPULSORY) [30 MARKS]

a. What is system model? Discuss different system perspectives that can be represented model **[2 marks]**

b. Give the TWO reasons for the steadily increasing interest in simulation applications **[2 marks]**

c. Explain THREE situations you think simulation and modeling is an appropriate tool. **[6 marks]**

d. Discuss the concept of system and system Environment as used in simulation and modeling. **[4 marks]**

e. Explain the properties of random number and its consequences. **[4 marks]**

f. Explain several entities, attributes, activities, events and state variables of a typical automatic teller machine (ATM). **[5 marks]**

g. Describe Kendal-lee notation for queuing system. **[3 marks]**

h. What is the meaning of the following representations in the context of a queuing system?

i. D/M/1/LIFO/20/510 **[2 marks]**

ii. M/M/8/15/LIFO **[2 marks]**

QUESTION TWO [20 MARKS]

a. Can a simulation model be verified but not valid and vice-versa? Explain with an example. **[2 marks]**

b. Explain different classification of mathematical models with appropriate examples. **[6 marks]**

c. Discuss any THREE techniques for verification of simulation computer programs and any THREE techniques you can apply in order to increasing model validity and credibility. **[6 marks]**

d. You are in the process of validating simulated model. Discuss THREE step approach of validation process that you will apply based on Naylor and Finger **[6 marks]**

QUESTION THREE [20 MARKS]

a. Explain the meaning of a queuing system and discuss the general elements/characteristics of a queuing system. **[6 marks]**

b. Provide the detailed flow chart of a typical arrival event and departure event in a single channel queuing system. **[4 marks]**

c. What are the various parameters used to measure the performance of a queuing systems? **[4 marks]**

d. In a petrol pump, Customer arrival time is given by Poison distribution within arrival rate of 2 Customer/hr and they get exponentially served at the rate of 3 Customer/hr.

Find:

i. Server Busy Time **[1 mark]**

ii. Server Idle Time **[1 mark]**

iii. Average no of Customer in system **[1 mark]**

iv. Average time spent in system **[1 mark]**

v. Average waiting time **[1 mark]**

vi. Average no of customers in queue **[1 mark]**

QUESTION FOUR [20 MARKS]

a. Explain Important features (or concepts) that define a business system **[4 marks]**

b. What is the necessity of differential equations in simulation? **[2 marks]**

c. Discuss the **FOUR** principles used in modelling process. In each case provide a real life justification. **[4 marks]**

d. Discuss the following methods used to analyze simulation results

i. Estimation Methods **[2 marks]**

ii. Simulation Run Statistics **[2 marks]**

iii. Replication of Runs **[2 marks]**

e. Explain the role of *financial modelling*, *Inter linked models and* corporate *modelling in* a simulation study. **[3 marks]**

QUESTION FIVE [20 MARKS]

a. Explain briefly any THREE Pitfalls in simulation and modeling. **[3 marks]**

b. Explain Montel Carlo simulation pointing out the important characteristics of this method. **[3 marks]**

c. Give definitions of a probability mass function of discrete random variable X and Joint probability mass function of two discrete random variables X and Y. **[4 marks]**

d. Suppose that X is a discrete random variable with the probability mass function given by: $p(i) = \frac{i}{15}$, where $i = \{1, 2, 3, 4, 5\}$:

i. Plot p(x) **[2 marks]**

ii. Compute and plot F(x) **[3 marks]**

iii. Compute $P(1.9999 \leq X \leq 4.0001)$ **[2 marks]**

iv. Compute E(X) and Var(X). **[3 marks]**