



NATIONAL OPEN UNIVERSITY OF NIGERIA

University Village, Plot 91, Cadastral Zone,
Nnamdi Azikiwe Expressway, Jabi, Abuja

**FACULTY OF SCIENCES
2021 EXAMINATIONS**

Course Code: CIT412
Course Title: Modelling and Simulation
Time Allowed: 2.5 Hours
Credits 3
Instruction: Answer Question one (1) and any other four (4) Questions.

Questions

- 1) Suppose that X is a discrete random variable with the probability mass function given by: $p(i) = \frac{1}{15}$, $i = 1, 2, 3, 4, 5$
- a) Compute $F(x)$ **8marks**
 - b) Compute $P(1.9999 \leq X \leq 4.0001)$ **3marks**
 - c) Compute $E(X)$ **5marks**
 - d) What is Modeling, Simulation, Modeling and Simulation?
(2marks each) = **6marks**

Total marks: 22

- 2). (a) Define the following terms, in the context of modeling and simulation:
- i) Verification
 - ii) Validation
 - iii) Credibility **3marks**
- (b) Can a simulation model be verified but not valid and vice-versa? Investigate your answer with an example for each. **2marks**
Discuss five (5) techniques for verification of simulation computer programs. **4marks**
- (d) Use question No. 1 and Compute $\text{Var}(X)$ **3marks**

Total marks: 12

- 3 (a) Discuss (5) techniques for increasing model validity and credibility **4marks**
- (b) List (5) major Pitfalls in modeling and simulation **3marks**
 - (c) Define the following terms:

- i) Experiment
 - ii) Sample space
 - iii) Probability mass function of discrete random variable X
 - iv) Joint probability mass function of two discrete random variables X and Y **3marks**
- (d) What is Data Coding? **2marks**

Total marks: 12

- 4
- (a) Briefly describe the following concepts:
 - i) Trace-driven simulation **1 mark**
 - ii) Empirical distributions **1 mark**
 - iii) Fitting (theoretical) distributions **1 mark**
 - (b) Mention any (3) advantages and disadvantages of each of the methods in (4-a) **3marks**
 - (c) Without diagram, illustrate the three-level architecture of data model **3marks**
 - (d) State the advantages and disadvantages of Mixed Methods **3marks**

Total marks: 12

- 5
- (a) List five steps involving in modeling procedure **2marks**
 - (b) A **database model** is a theory or specification describing how a database is structured and used. Several such models have been suggested. The common models include: **4marks**
 - (c) Define queuing theory and explain the queuing disciplines **3marks**
 - (d) What are the general procedure for constructing and analyzing queuing models? **3marks**

Total marks: 12

- 6 (a) **Ada** earned a score of 940 on a national achievement test. The mean test score was 850 with a standard deviation of 100. What proportion of students had a higher score than Ada? (Assume that test scores are normally distributed.) **4marks**
- (b) Explain the Kendall's notations **2marks**
- (c) What do you understand by birth-death process in queues? **3marks**
- (d) Differentiate between the next event scheduling and process operation-based simulations **3marks**

Total marks: 12