



**NATIONAL OPEN UNIVERSITY OF NIGERIA**

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

**FACULTY OF SCIENCES**  
**Computer Science Department**  
**2023\_1 POP EXAMINATION**

Course Code: CIT 412

Course Title: **Modelling & Simulation**

Credit: **3 Units**

Time Allowed: **3 hours**

Instruction: Answer Questions One (1) and any other THREE (3) questions

**Questions One (25 Marks) – Compulsory**

1 (a) Define the following terms:

- (i) Model.
- (ii) Modelling.
- (iii) Simulation.

(3 marks)

1 (b) Outline the steps involved in modelling.

(8 marks)

1 (c) Consider the following test scores, 14, 20, 19, 17, 15, 15, 18, 14, 13, 15

- (i) List and determine (calculate) the three (3) measures of central tendency for the scores (6 marks)
- (ii) Calculate the variance (2 marks)
- (iii) Calculate the standard deviation (2 marks)

1 (d) (i) Distinguish between the following sampling methods: Stratified and Cluster. (2 marks)

(ii) Explain, with one example, the term multistage sampling. (2 marks)

**Question 2 (15 marks)**

2 (a) Chiamaka earned a score of 940 on a national achievement test. The mean test score was 850 with a standard deviation of 100. List the steps to determine what proportion of students had a higher score than Chiamaka? (Assume that test scores are normally distributed.) (6 marks)

- 2 (b) Describe two uses of medical simulations. (2 marks)
- 2 (c) Describe a method for of evaluating Model simulations. (2 marks)
- 2 (d) List five factors that are importance in evaluations a model. (5 marks)

**Question 3 (15 marks)**

- 3 (a) Describe three features of visual models. (6 marks)
- 3 (b) Define the *Finite Element Model*. (4 marks)
- 3 (c) Sequentially, outline the steps involve in solving partial differential equations. (5 marks)

**Question 4 (15 marks)**

- 4 (a) Describe two type of data modelling as determined by Whitten. (2 marks)
- 4 (b) Explain three (3) common database models. (6 marks)
- 4 (c) Contrast between descriptive and inferential statistics. (4 marks)
- 4 (d) Describe a *time-driven simulation*. (3 marks)

**Question 5 (15 marks)**

- 5 (a) Explain the term – queuing theory. (2 marks)
- 5 (b) Describe three (3) queuing disciplines. (6 marks)
- 5 (c) Describe Kendall's notation. (3 marks)
- 5 (d) If the average rate of telephone calls received at an exchange of 8 lines is 6 per minute. Find the probability that a caller is unable to make a connection if this is defined to occur when all lines are engaged within a minute of the time of the call.

Recall:  $f(k; \lambda) = \frac{e^{-\lambda} \lambda^k}{k!},$  (4 marks)

**Question 6 (15 marks)**

- 6 (a) Outline the general procedure for constructing and analysing queuing models. (6 marks)
- 6 (b) List two (2) discrete-event simulation languages, two (2) continuous simulation languages and two (2) hybrid simulation languages. (6 marks)
- 6 (c) Contrast between next-event scheduling and process operations. (3 marks)