NATIONAL OPEN UNIVERSITY OF NIGERIA

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

FACULTY OF SCIENCES

Computer Science Department

2022_2 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) Outline six (6) features of a visual model.

(6 marks)

1 (b) Consider the set of three possibilities for `X, Y, Z` → `X(1, 2, 3), Y(4, 5, 6)` and `Z(7, 8, 9)` and the corresponding probability function as shown in the table below.

Determine if the probability functions → `f(x), g(y), h(z)` - with the following probabilities are valid and **why/why not**?

x	f(x)	y	g(y)	z	h(z)
1	0.44	4	-0.23	7	0.32
2	0.25	5	0.38	8	0.48
3	0.31	6	0.85	9	0.22

(6 marks)

1 (c) Describe any three (3) ways to handle outliers.

(3 marks)

1 (d) The TMA scores for students taking a CIT class are shown below.

Using the data above:

(i) List and determine (calculate) three (3) measures of central tendency. **(6 marks)**

(ii) Calculate the variance **(2 marks)**

(iii) Calculate the standard deviation **(2 marks)**

Question Two

2 (a) Briefly describe any six (6) of the following simulation terminologies: State, Event, Entity, Queue, Creating, Scheduling, Random Variable, Random Variate, or Distribution.

(6 marks)

2 (c) Evaluate any four (4) of the following types of models - Physical, Mathematical, Analogue, Simulation, Heuristic, Stochastic or Deterministic models.

(4 marks)

2 (c) Outline five (5) properties of a good random number generator.

(5 marks)

Question Three

3 (a) Discuss the three (3) levels of modelling assumptions.

(6 marks)

3 (b) Describe the ***congruential method*** for generating random numbers.

(6 marks)

3 (c) Briefly discuss the following terms:

(i) Model

(ii) Modelling

(iii) Simulation **(3 marks)**

Question Four

4 (a) Describe two types of data modelling as determined by Whitten.

(3 marks)

4 (b) Discuss three (3) common database models. **(6 marks)**

4 (c) Briefly explain three (3) queuing disciplines **(6 marks)**

Question Five

5 (a) Describe Kendall's notation. **(3 marks)**

5 (b) List two (2) discrete-event simulation languages, two (2) continuous simulation languages and two (2) hybrid simulation languages.

(6 marks)

5 (c) Contrast between next-event scheduling and process operations.

(6 marks)

Question Six

6 (a) Enumerate any three (3) methods of estimating population variances for sample size determinations as determined by Cochran (1977).

(3 marks)

6 (b) Discuss the following terms giving one area of application:

i. Exponential Density Function (EDF)

ii. Poisson Process **(6 marks)**

6 (c) Discuss any three (3) of the main methods of data collection.

(6 marks)