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 308**

Course Title: **Formal Methods and Software Development**

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 any two (2) characteristics of high-quality software.

(2 marks)

1 (b) Describe four (4) phases of a typical software development cycle.

(6 marks)

1 (c) Critique two (2) classifications of formal methods.

(5 marks)

1 (d) Complete the truth table for the proposition **(A → B) v (B → A)**

A	B	(A → B)	(B → A)	Result: (A → B) v (B → A)
T	T			
T	F			
F	T			
F	F			

(12 marks)

Question 2

2 (a) State the condition(s) under which a formula is:

i) A tautology

ii) Consistent

iii) Inconsistent

(1 mark each – Total = 3 marks)

2 (b) For the statements below, identify the (i) constant (ii) variable object (iii) function –

An ostrich has wings can fly; An eagle has wings can fly.

(3 marks)

2 (c) Explain with examples the following terminologies:

i. Family sets

ii. Power sets

iii. Disjoint sets

(3 mark each – Total = 9 marks)

Question 3

3 (a) Explain the terms (i) Bound variable (ii) Free variable.

(3 marks)

3 (b) Given the following:

$A = \{1, 2, 5, 7, 9, 10\}$

$B = \{-1, 3, 5, 8, 10\}$

$C = \{2, 4, 6, 8, 10\}$

Calculate the following:

i.	$A \cup B$	v.	$A \cap B$
ii.	$A \cup C$	vi.	$A \cap C$
iii.	$B \cup C$	vii.	$B \cap C$
iv.	$A \cup B \cup C$	viii.	Show your results in a Venn diagram

(12 marks)

Question 4

4 (a) Describe with examples two types of sequences.

(3 marks)

4 (b) (i) State the formula for a geometric sequence.

(ii) Given: X = 4, 16, 64, 256, 1024, Calculate the 10^{th} term.

(3 marks)

4 (c) List and explain with examples three (3) types of proofing methods.

(9 marks)

Question 5

5 (a) Describe any five (5) stages (or activities) in the ***Software Development Life Cycle (SDLC)***

(5 marks)

5 (b) Outline any four (4) processes that ***formal specification*** follows.

(4 marks)

5 (c) Discuss any three (3) types of the testing concept - ***Test Size*** - in software development.

(6 marks)

Question 6

6 (a) Discuss any two (2) laws of ***Software Evolution***.

(4 marks)

6 (b) Describe any two (2) results of software design levels.

(4 marks)

6 (c) (i) Explain the term Cohesion. **(2 marks)**

(ii) Describe any five (5) types of cohesion **(5 marks)**