



NATIONAL OPEN UNIVERSITY OF NIGERIA

PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI-ABUJA

FACULTY OF SCIENCES

DEPARTMENT OF COMPUTER SCIENCE

2023_2 EXAMINATIONS

COURSE CODE: CIT308

COURSE TITLE: FORMAL METHODS AND SOFTWARE DEVELOPMENT

COURSE CREDIT: 3 UNITS

TIME ALLOWED: 2 HOURS

INSTRUCTION: ANSWER QUESTION 1 AND ANY OTHER THREE QUESTIONS

Q1

- (a) Highlight 8 requirements of user interface **4 marks**
- (b) Draw a level 0 data flow diagram for hotel reservation system? **5 marks**
- (c) Construct a truth table for the formula $((a \rightarrow b) \wedge (b \rightarrow c)) \leftrightarrow \neg a$ **12 marks**
- (d) Enumerate 8 advantages of using formal methods? **4 marks**

Q2

- (a) Show that the inverse and the converse of a conditional are logically equivalent **8 marks**
- (b) Explain Universal and Existential statements? **7marks**

Q3

- (a) Complete the table comparing the three testing models under the highlighted areas?

| Areas | Unit Testing | System Testing | Integration Testing |
|------------------|--------------|----------------|---------------------|
| Objective | | | |
| Scope | | | |
| Test Environment | | | |
| Dependencies | | | |

12 marks

- (b) Explain model checking as a formal methods technique?

3 marks

Q4

(a) Complete the table to compare V-model with Spiral model using any 4 differences

| Differences | V-Model | Spiral Model |
|-----------------------------|---------|--------------|
| Development Approach | | |
| Emphasis | | |
| Testing Integration | | |
| Feedback from Customer | | |
| Change Management | | |
| Project Size and Complexity | | |
| Risk Management | | |
| Development Flexibility | | |
| Planning and Documentation | | |
| Project Cost and Complexity | | |

12 marks

(b) Using a diagram only, describe the big-bang model?

3 marks

Q5

(a) Given: $X = \{4, 7, 3, 2, 6\}$; $Y = \{3, 2, 7, 2, 1\}$ and $Z = \{8, 10\}$. Describe and compare $(X \cap Y) \cap Z$ and $(X \cup Y) \cup Z$

12 marks

(b) Using a diagram, describe forward engineering?

3 marks

Q6

(a) Complete any 6 dissimilarities in the table for universal and existential statements below:

| Differences | Universal Statements | Existential Statements |
|--------------------|----------------------|------------------------|
| Quantifier | | |
| Assertion | | |
| Scope | | |
| Existential Import | | |

| Differences | Universal Statements | Existential Statements |
|-------------------------|----------------------|------------------------|
| Negation | | |
| Generalization | | |
| Symbolic Representation | | |

12 marks

(b) List 6 contents of a test plan?

3 marks

