



NATIONAL OPEN UNIVERSITY OF NIGERIA
Plot 91, Cadastral one, Nnamdi Azikiwe Expressway, Jabi, Abuja
Faculty of Science
Computer Science Department
2024 I EXAMINATION

PROGRAMME: B.Sc.
COURSE TITLE: FORMAL LANGUAGES AND AUTOMATA THEORY
COURSE CODE: CIT342
CREDIT UNIT: 3
DURATION: 2½ HRS

Instructions: Answer Question ONE (I) and any other three questions

1(a) Determine the Set of String in the Following sets

- i) $\{0, 1\}^* \{a, b, c, d\}$
- ii) $\{a, ba, \}^* \{0, 1\}$
- iii) $\{0, 1\}^* \{a, b\}$ (9 marks)

- (b) State the variations in the Transition Function and Acceptance Condition that exist in components of automata (10 marks)
- (c) Give regular expressions that generate each of the following languages. In all cases, the alphabet is $\Sigma = \{a, b\}$
- i) The language $\{ w \in \Sigma^* \mid |w| \text{ is odd } \}$.
 - ii) The language $\{ w \in \Sigma^* \mid w \text{ has an odd number of a's } \}$.
 - iii) The language $\{ w \mid w \text{ contains at least two a's, or exactly two b's } \}$.
 - iv) The language $\{ w \in \Sigma^* \mid w \text{ ends in a double letter } \}$. (A string contains a double letter if it contains aa or bb as a substring.)
 - v) The language $\{ w \in \Sigma^* \mid w \text{ does not end in a double letter } \}$.
 - vi) The language $\{ w \in \Sigma^* \mid w \text{ contains exactly one double letter } \}$. (6 Marks)

- 2(a) State at least three Steps and the corresponding Method to Construct a right-linear grammar for any given left-linear grammar (9 marks)
- b) Discuss the definition concept of FSA (6 marks)

- 3(a) Defined the Closure Properties of Regular Languages (5 marks)
- (b) Distinguish between right-linear grammar and left-linear grammar (10 marks)

- 4(a) Using the pumping lemma Show that the language $L = \{a^i b^i c^i \mid i \geq 1\}$ is not context free. (10 marks)
- b) State two ways to use a grammar (5 marks)