



NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY
MARCH/APRIL 2015 EXAMINATION

Course Code: CIT 342
Course Title: Formal Languages and Automata Theory
Time: 3hrs
Course Credit Unit: 3
Instruction: Attempt any five (5) questions. Each question carries 14 marks

- 1a) A non-deterministic finite automaton is not more powerful than a deterministic finite automaton. Discuss. (4 marks)
- b) Thinking of an automaton as a computer, state the way(s) it can handle non-determinism? (3 marks)
- c) State **two** of the ways of implementing a DFA. (2 marks)
- d) With respect to regular expressions, what is the precedence of the following operations relative to one another? (4 marks)
- i) Kleene Star
 - ii) Concatenation
 - iii) Union
- 2a) State the formal definition of a PDA. (7 marks)
- b) List and describe the types of PDAs. (4 marks)
- c) Distinguish between an alphabet and a language) 3 marks
- 3a) Distinguish between context-free grammar and regular grammar) 4 marks
- b) List the three ways of defining a language (4½ marks)
- c) Formally define an automaton) 5½ marks
- 4a) What is a sentential form?) 2 marks
- b) Consider the linear grammar: $(\{S, B\}, \{a, b\}, S, \{S \rightarrow aS, S \rightarrow B, B \rightarrow bB, B \rightarrow \lambda\})$. Give any three sentential form of this grammar) 3 marks
- c) List and describe the various components of a formal grammar.) 6 marks
- d) What do you understand by the term *automata theory*?) 3 marks
- 5a) State Godel incompleteness theorem) 2 marks
- b) Define context-sensitive grammars) 2 marks
- c) Write short note on decision problems?) 3 marks
- d) When is a formal system said to be:
- i) Complete?)
 - ii) Inconsistent?) 2marks each
- e) Let V be a set of strings. Does $V^+ = V^*$? Justify your answer.) 3 marks
- 6a) Describe any three of the popular variations in the definition of different components of automata.
- b) What is/are the use(s) of Greibach Normal Form? (2 marks)
- 7a) List any four types of automata and state their respective recognizable language.
- b) In the context of automata theory, briefly describe the following terms:
- i. Recognised language
 - ii. Run
 - iii. Transducer

