NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS
MARCH/APRIL 2016 EXAMINATION

SCHOOL OF SCIENCE AND TECHNOLOGY

COURSE CODE: **CIT342**
COURSE TITLE: **Formal Languages and Automata Theory**

Time: **2½ hrs**
***Course Credit Unit*: 3**
Instruction: **Answer any five (5) questions. Each question carries 14 marks**

1a) State Gödel 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

2 a) 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

3a) 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

4a) 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

5a) 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

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) 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