NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY
MAY/JUNE 2012 EXAMINATION

CIT 342 Formal Languages and Automata Theory
Time Allowed: 3 hrs

Instruction: Answer any five (5) questions. Each question carries 14 marks

1a) Distinguish between a word and a vocabulary in formal language. Use examples to illustrate your answer) 5 marks
b) Let V be a set of strings. Does $V^+ = V^*$? Justify your answer.) 3 marks
c) Enumerate the components for a formal grammar.) 6 marks

2a) Distinguish between context-free grammar and regular grammar) 4 marks
b) Distinguish between an alphabet and a language) 3 marks
c) Enumerate any two of the typical questions asked about formalism in formal language theory.) 4 marks
d) Define automata theory.) 3 marks

3a) Formally define an automaton) 8 marks
b) Describe any three of the popular variations in the definition of different components of automata.

4a) List any four types of automata and state their respective recognizable language.) 8 marks
b) In the context of automata theory, briefly describe the following terms:
i. Recognised language)
ii. Run) 2 marks each
iii. Transducer)

5a) State two of the ways of implementing a DFA.
b) Thinking of an automaton as a computer, state the way(s) it can handle non-determinism? (3 marks)
c) Is an NFA more powerful than a DFA? Explain (4 marks)
d) State the precedence of the following with respect to regular expressions) 4 marks
i) Kleene Star
ii) Concatenation
iii) Union
iv) Parentheses

6a) Formally define a PDA
b) List and describe the types of PDAs.
c) List the three ways of defining a language
7a) State the Halting Problem.) 2marks
b) Enumerate the mathematical concepts needed to proof the Halting Problem

c) What does it mean to say a formally stated problem is:

i) Unsolvable?)

ii) Provably unsolvable?) 2 marks each. Total = 6 marks

iii) Undecidable?)