NATIONAL OPEN UNIVERSITY OF NIGERIA
University Village, 91 Cadastral Zone, Nnamdi Azikwe Expressway, Jabi, Abuja
FACULTY OF SCIENCES
COMPUTER SCIENCE DEPARTMENT
2021 EXAMINATIONS

CIT 342 – Formal Languages and Automata Theory **Credit: 3 units**

TIME ALLOWED: 2½ Hours
INSTRUCTION: Answer Question 1 and any other FOUR (4) Questions

1a(i) What is a formal language? (2 marks)

1a(ii). What is parsing? (2 marks)

1b(i).How is Backus-Naur Form used to describe a formal language? 1mark

1b(ii0. What is a Turing Machine? How does it operate? 5 marks

1b(iii) . What is Godel out to solve? 2 marks

1c. Differentiate among the classes of grammar defined by Noam Chomsky (8 marks)

2a. What is left recursive grammar? (2 marks)

2b. What are the three mathematical concepts that can be used to prove the halting problem? 6 marks

2c. How is Σ^* differ from Σ^+ given that $\Sigma = \{0,1\}$? (4 marks)

3a. Describe what is meant by decision problem. (2 marks)

3b What is a vocabulary in respect to language theory? Mention the two approaches that can be used to describe a language over a set of vocabulary 3 marks

3d. How does the automaton run and accept strings? 2 marks

3d.Cite five classes of automata and the type of language they recognize 5 marks

4a What are the meanings of the following rules of regular expression (3 marks)

i. If r1 is a regular expression, so also is (r1)
ii. If r1 and r2 are regular expression, then so is r1r2
iii. If r1 and r2 are regular expression, then so is r1+r2

4b List three ways that can be used to definea language (3 marks)

4c How is right-linear grammar differ from left-linear grammar? (4 mark

4d What is a pigeonhole? What is its usefulness (2 marks)

5a Produce the right-most and left-most derivation of the string abbc from this grammar G = ({S, A,B, C}, {a,b, c}, S, P) and P = {S→ABC, A→aA,A→l, B→bB,B→l,C→cC, C→l}. (2 marks)

5b. What is the difference between

i. Partial derivation tree ii, Yeld of syntax tree and iii. Sentential form (3 marks)

5c Explain the term "ExhaustiveParsing" (2 marks)

5d. What is pushdown automaton? How is it different from Non-Deterministic Finite State automaton?

6a. When is a grammar in Greibach Normal form? What is its limitation and strength (3 marks)

6b. Give the resulting grammar after removing E production in the following grammar (2marks)

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S → AB
A → aAA | ε
B → bBB | ε
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6c Using derivation method, parse the string ***aabb*** using the grammar production below (2 marks)

S→ AS|BS |AB |B |A | ε
B →b|S
A → S |a

6d What is a Unit production? How can it be eliminated? (5 marks)