ELIZADE UNIVERSITY
ILARA-MOKIN
ONDO STATE

FACULTY: BASIC AND APPLIED SCIENCES
DEPARTMENT: MATHEMATICS AND COMPUTER SCIENCE
2nd **SEMESTER EXAMINATION**
2020 / 2021 **ACADEMIC SESSION**

COURSE CODE: CSC 420

COURSE TITLE: Theory of Automata and Computing

COURSE LEADER: Dr. K. Agbele

DURATION: 2 Hours

HOD's SIGNATURE

INSTRUCTION:

Candidates should answer any FOUR (4) Questions.

Students are warned that possession of any unauthorized materials in an examination is a serious assessment offence

Students are permitted to use ONLY a scientific calculator.

1(a) What is an automaton? List and explain the types of Automaton.
(b) Explain the following components of a Finite Machine (i) Input (ii) Return (iii) State (iv) Start State (v) Accepting State (vi) Rejecting State (vii) Dead State (viii) Transition
(c) When is a string accepted by a Non-Finite State Automaton (NFA)?
(d) List five applications of Finite Machine
(e) Design a DFA over [a.b] accepting {baa, ab, abb}   **(15 marks)**

2. (a) Explain the following terms with examples: (i) Alphabet (ii) Strings (iii) concatenation (iv) reverse of a string (v) length of a string (vi) Empty string (vii) Derivation of sentence (viii) Kleen Closure (ix) Prefix of a string (x) Positive Closure
(c) Convert the transition table below to DFA

	a	b
{1, 3}	{1, 3}	{2}
{2}	{2, 3}	{3}
{2, 3}	{1, 2, 3}	{3}
{3}	{1, 3}	φ
{1, 2, 3}	{1, 2, 3}	{2, 3}
φ	φ	φ

(d) What is an identifier? .
(e) Explain transition graph or system with the aid of a diagram.   **(15 marks)**

3. (a) Why is theory of Computation important? Hence explain the 3 interacting components.
   (b) If $\Sigma = \{a, b, c\}$, then find the following (i) Σ^1 (ii) Σ^2 (iii) Σ^3 (iv) Σ^4 (v) Σ^0
   (c) Explain how a DFA process strings?
   (d) What is Language of a DFA?
   (e) Explain the theory of Backus-Naur Form (BNF)   **(15 marks)**

4. (a) Construct a DFA that accept the language L = {010, 1} ($\Sigma = \{0, 1\}$)
(b) Construct a DFA over alphabets {0, 1} that accept all strings that end in 101.
Hint: The DFA must remember the last 3 bits of the string it is reading.
(c) Build an automaton that accepts all and only those strings that contain 101
(d) Consider the following grammar:

$$S \longrightarrow SA/A$$
$$A \longrightarrow aAb/\lambda$$

Show the left-most-derivation, rightmost, and derivation tree for the string
(e) Design a DFA accepting all string over $\Sigma = \{0,1\}$ ending with 3 consecutives 0's.
                                                           (15 marks)
5. (a) Construct a DFA, that accept all the string over $\Sigma = \{a, b\}$ that do not end with *ba*.
   (b) Explain what the following denotes (i) a* (ii) (a/b)* (iii) a/a*b (iv) (a/b) (a/b) (v) a/b
   (b) What are regular expressions?
   (d) Given a Grammar G = (V_N, Σ, P, S), where
   V_N = (<sentence>, <noun>, <verb>, <adverb>)
   P = (Babalola, Akinwumi, drive, sang, well)
   S = <sentence>
   Highlight the production rules to the above grammar G.
   (e) What is acceptability of a string by finite automata?   **(15 marks)**