

ELIZADE UNIVERSITY

ILARA-MOKIN



FACULTY: BASIC AND APPLIED SCIENCES
DEPARTMENT: MATHEMATICS AND COMPUTER SCIENCE
1st SEMESTER EXAMINATION
2020 / 2021 ACADEMIC SESSION

COURSE CODE: CSC 309 COURSE TITLE: Compiler Design

COURSE LEADER: Dr. Kehinde Agbele DURATION: 2Hours

HOD's SIGNATURE

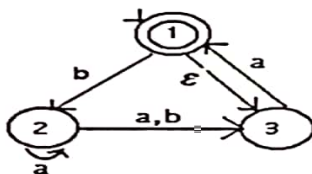
INSTRUCTION:

Candidates should answer Question ONE and any THREE Questions

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

1. (a) Give a regular expression for an identifier composed of letters, digits, and underscores that begins with a Letter (denote it by L), ends with a letter or digit (denote it by D), and contains no consecutive underscores (denoted by $_$). You may use $[]$ for optional and $+$ for 1 or more.

(b) Why is the diagram below Non-deterministic automaton (NFA)?



(b) 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

- (c) Write a RE for the set of string that consists of alternating 0's and 1's over $\{0,1\}$.
- (d) What language does the regular expression $(0|1)^*0(0|1)(0|1)$ generate?
- (e) Construct a DFA over $\{0,1\}$ accepting $\{1, 01\}$
- (f) Design a DFA accepting zero or more consecutive 1's. i.e $L(M) = \{1^n/n = 0,1,2,\dots\}$
- (g) Explain the following components of a Finite Machine with aid of a diagram
- (i) Intermediate States (ii) State (iv) Start State (v) Final State (vi) Rejecting State
- (viii) Transition
- (h) Construct a DFA over $\{a,b\}$ that accepts the strings ending with abb.

2. (a) What is an interpreter?

- (b) Construct a finite automaton that will accept a string of zeros and ones that contains an odd number of zeros and an even number of ones. Hence, list the regular expression in the transition diagram.
- (c) What are the various types of intermediate code representation?
- (d) Represent $\{ab, a, b, bb\}$ and $\{\lambda, ab\}$ sets by regular expression.
- (e) Explain the derivation principles and the options available.

3. (a) Explain the two parts of compilation process?

- (b) Define lexical analyser? Explain with the aid of diagram how it processes tokens.
- (c) Discuss about the principle sources of code optimization.
- (d) Differentiate between lexeme, token and pattern
- (e) Explain with examples the various operations on languages.
- (f) What is a finite automaton? List the mathematical model of a DFA.

4. (a) Define Compiler. What are the phases of the Compiler? Explain with a neat diagram.

- (b) What is the importance of code optimization in compiler design?
- (c) What are Compiler construction tools? Explain its specifications in detail.
- (d) What is the purpose of semantic analysis in a compiler?
- (e) Explain the derivation principles and the options available.
- (f) Determine all strings in $L((a+b)^*b(a+ab)^*)$ of length less than five.

5. (a) Let $M = (\{q_1, q_2, q_3\}, \{0,1\}, \{q_1\}, \{q_3\})$ is a NFA where δ is given by

$$\begin{array}{ll} \delta(q_1, 0) = \{q_2, q_3\} & \delta(q_1, 1) = \{q_1\} \\ \delta(q_2, 0) = \{q_1, q_2\} & \delta(q_2, 1) = \{\Phi\} \\ \delta(q_3, 0) = \{q_2\} & \delta(q_3, 1) = \{q_1, q_2\} \end{array}$$

- (i) Construct an equivalent DFA and draw the transition diagram
- (ii) Check whether the string '011010' is accepted by DFA
- (b) Design a DFA accepting all strings that end in 01.
- (c) Differentiate among regular expressions, regular grammar and regular language.
- (d) What is a parse tree? Illustrate with an example.
- (e) Explain the types of parsing with an example.
- (f) If $\Sigma = \{a, b, c\}$ then find the followings (i) Σ^1 (ii) Σ^2 (iii) Σ^3