MOSHOOD ABIOLA POLYTECHNIC, ABEOKUTA

DEPARTMENT OF COMPUTER SCIENCE 14/61/0044

FIRST SEMESTER EXAMINATION 2023/2024 SESSION

COURSE TITLE: COMPILER CONSTRUCTION **COURSE CODE:** COM 413

CLASS: COMP. SCI. HND II **(FT & PT)** **TIME ALLOTTED:** 3HRS

INSTRUCTION: 1. Attempt **ANY FOUR QUESTIONS** from SECTION A and **ALL QUESTION** SECTION B

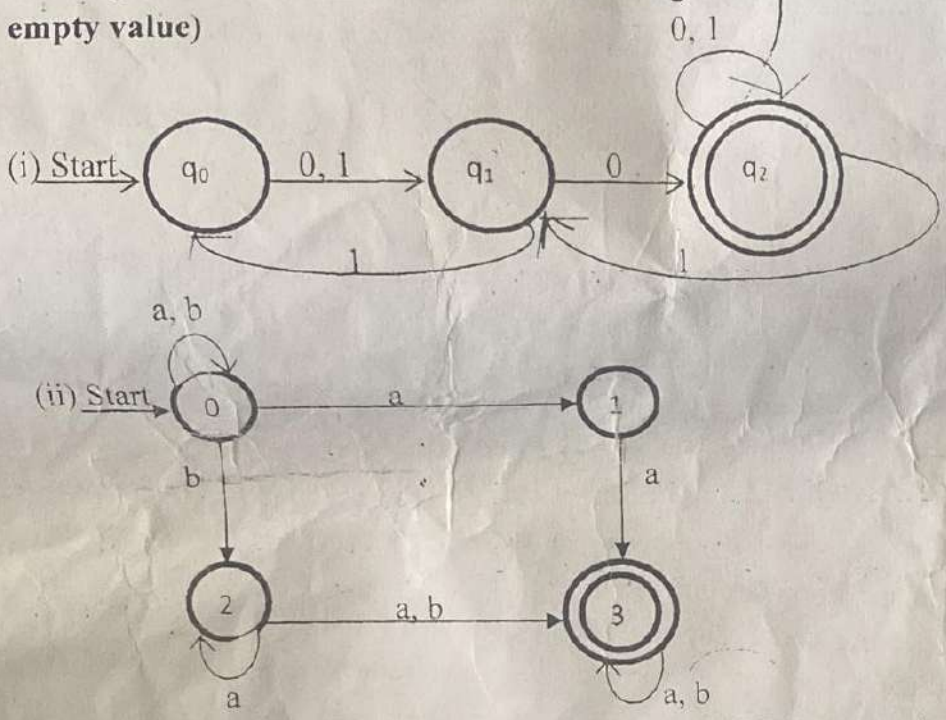
2. Write only your matric number on the question paper, nothing else.

SECTION A

1a. What do you understand by Optimization? Briefly differentiate between the two kinds of optimizatio

b. Mention five (5) factors that determine the number of parses

c. Design the transition table of the following NFA transition graph below. **(Note: Use epsilon (ε) f empty value)**



d. Match the following basic types of grammars with its respective formal grammars:

i. Type-2 grammar	Regular grammar
ii. Type-0 grammar	Context-sensitive grammar
iii. Type-3 grammar	Unrestricted grammar
iv. Type-1 grammar	Context-free grammar

(20mk

2a. What do you understand by Recognizer? Differentiate between NFA and DFA

b. What does the following icons represents: (i) X^* (ii) X^+ (iii) X?

c. Construct the NFA transition graph for the following expression: (i) (b|a)*bab (ii) $a^+ | abb | a^*b^+$

d. Construct and explain the mathematical model of FA

(20mk

3a. Provide the output of the following phases: (i) Lexical Analyzer (ii) Intermediate Code Generator (iii) Semantic Analyzer (iv) Code Generator (v) Syntax analyzer

b. Write briefly on the following terms: (i) Pass (ii) Lexeme (iii) Language (iv) Phases (v) Alphabet

c. Explain context-free grammar by corresponding to G, N, T, P, S

d. Design the parse tree for the following expressions: (i) $W + K * 2 - B/6$ (ii) $^{F}/_{C} - (3 \uparrow D) * E$

(20mks)

4a. Use the below grammar construct to ascertain the correctness of the following expressions: (i) $(a \uparrow 4) * k * 6/d$ (ii) $w + 8 * 2 \uparrow 4/h * 9$

$E \rightarrow E - T \mid E + T \mid T$

$T \rightarrow T * F \mid T/F \mid T \uparrow F \mid F$

$F \rightarrow (E) \mid id \mid c$

b. Mention five (5) semantics errors recognized by the semantic analyzer

c. What do you understand by lexical errors? Itemize the four (4) error recovery actions when lexical errors were detected

d. What do you understand by Ambiguous Grammar? State two (2) ways by which ambiguity can be removed

(20mks)

5a. Given grammar with the production below; (i) Determine the language of the grammar (ii) Determine the handle of the sentential form

(a) $S \rightarrow Ad \mid Bc$

$A \rightarrow aAb \mid ab$

$B \rightarrow aBbb \mid abb$

(b) $S \rightarrow aAbc$

$Ab \rightarrow bA$

$Ac \rightarrow Bbcc$

$bB \rightarrow Bb$

$aB \rightarrow aaA/\varepsilon$

b. Describe Dead-code Elimination and Loop Optimization

c. Briefly explain the following parsing under Top-down and Bottom-up parsing: (i) Recursive descent (ii) Backtracking (iii) Shift Reduce

d. Itemize four (4) drawbacks of Syntax analyzer

(20mks)

SECTION B

1. A _____ is a program that takes as input a program written in one language and produces as output a program in another language. A. Translator B. Assembler C. Compiler D. Interpreter
2. An interpreter is a program that directly executes _____ code. A. Source B. Object C. Intermediate D. Subject
3. A compiler takes as input a source program and produces as output an equivalent sequence of _____. A. User program B. Object language C. Machine instructions D. Call
4. Syntactic structure can be regarded as a tree whose leaves are the _____. A. Scanner B. Parser C. Tokens D. Macro