



(*Knowledge for Development*)
KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

**YEAR THREE SEMESTER ONE EXAMINATIONS
FOR THE DEGREE OF BACHELOR OF SCIENCE
COMPUTER SCIENCE**

**COURSE CODE : CSC 310.
COURSE TITLE : COMPILER CONSTRUCTION
AND DESIGN**

DATE: 22/12/2022 TIME: 2:00 P.M – 4:00 P.M.

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO

QUESTION ONE (COMPULSORY) [30 MARKS]

- a) Describe the input and output of Syntax Analyzer. **[2 Marks]**
b) Describe the term Compiler **[2 Marks]**
c) Emmanuel a Third-year students Input the following Contents in a filed named Kibabii1.txt:

aabb

abb

13

10

cc

_abb

aa_bbb

-7

+8

&6

Give the output of the following regular expression Linux commands

- i. `grep -E '^ [+]? [1-9] [0-9] *|0$' Kibabii1.txt` **[2 Marks]**
ii. `grep -E '^ [a-zA-Z_] [0-9a-zA-Z_] *' Kibabii1.txt` **[2 Marks]**
iii. `grep -E '^ [1-9] [0-9] *|0' Kibabii1.txt` **[2 Marks]**
d) Describe the term finite automata **[4 Marks]**
e) Explain the reason for keeping the lexical and syntactical phases separate **[6 Marks]**
f) Describe precedence and associativity in Compiler Construction and Design **[4 Marks]**
g) Describe **THREE** areas where compiler technology is applied **[6 Marks]**

QUESTION TWO [20 MARKS]

- a) Define a String. **[2 Marks]**
- b) Describe the role of Symbol table. **[4 Marks]**
- c) Describe 3 address code as known in compiler design. **[4 Marks]**
- d) Eliminate left recursion from:
 $S \rightarrow Aa \mid b \quad A \rightarrow Ac \mid Sd \mid \epsilon$ **[6 Marks]**
- e) Describe the role and need of error handler. **[4 Marks]**

QUESTION THREE [20 MARKS]

- a) Is this grammar ambiguous? If so, prove it and construct a non-ambiguous grammar that derives the same language. $S \rightarrow aS \mid aSbS \mid c$ **[6 Marks]**
- b) Give a Regular Expression and DFA for: $L = \{x \in \{0, 1\}^* \mid x \text{ ends with } 1 \text{ and does not contain the substring } 00\}$ **[4 Marks]**
- c) Differentiate between Directed acyclic graph (DAG) and Syntax tree **[5 Marks]**
- d) With clarity distinguish between code optimization and code generation **[5 Marks]**

QUESTION FOUR [20 MARKS]

- a) Describe loop optimization **[4 Marks]**
- b) Describe reduction and strength in code optimization. **[6 Marks]**
- c) Describe the advantage of directed acyclic graphs **[5 Marks]**
- d) Describe the limitation of syntax analyzer. **[5 Marks]**

QUESTION FIVE [20 MARKS]

- a) Why do we need to do register allocation on the output of instruction selection? **[2 Marks]**
- b) Give one reason why compilers use intermediate representations instead of translating directly from source to target language. **[4 Marks]**
- c) Describe top-down parsing. **[6 Marks]**
- d) With the aid of a diagram well labelled explain all phases of compiler starting from source code to target code **[8 Marks]**