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(Knowledge for Development)

KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR**

**END OF SEMESTER EXAMINATIONS
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: 19 /05/2022

TIME: 02:00 P.M – 04:00 P.M

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE (COMPULSORY) [30 MARKS]

- a)
- i. Distinguish between code optimization and code generation [4 Marks]
 - ii. Explain the activities that fall in front-end of a compilation process [6 Marks]
 - iii. Distinguish between context-free grammar and context-sensitive grammar [4 Marks]
 - iv. What is the Input and Output of semantic analyzer [2 Marks]
- b)
- i. With the aid of appropriate diagrams describe the **TWO** types of scope Management. [6Marks]
 - ii. Describe Heap allocation during runtime [6Marks]
 - iii. A symbol table can be implemented in 3 ways. Describe any **TWO** ways. [2 Marks]

QUESTION TWO [20 MARKS]

- a) Describe syntax analyzer. (Draw appropriate diagram). [5Marks]
- b) Describe the following [5Marks]
- i. Recursive descent parsing
 - ii. Context free grammar
- c) With the aid of diagram describe shift reduce parsing [6Marks]
- d) Describe the role of an Activation tree [4Marks]

QUESTION THREE [20 MARKS]

- a) Determine if the following statements are **TRUE/ FALSE** [6Marks]
- i. If languages L_1 and L_2 are regular, then concatenation L_1L_2 is also regular.
 - ii. In regular expression notation $*$ represents one or more occurrence of the preceding symbol.
 - iii. If L is regular language then the complement of L is a regular language
 - iv. All subsets of a regular language are regular
 - v. If M is finite automaton, then there is a regular expression E such that $L(M)=L(E)$
 - vi. Regular expression $(0+1)^*$ recognizes set of all strings over $\{0,1\}$
- b) With the aid of an example describe directed acyclic graph (DAG). [6Marks]
- c) Describe Left factoring [4 Marks]

- d) Show how identifiers, numbers with decimal numbers and numbers with exponent can be represented using Context Free Grammar [6 Marks]
- e) Describe the backtracking [4Marks]

QUESTION FOUR [20 MARKS]

- a) Describe bottom-up parsing. [10 Marks]
- b) Given the following grammar: Draw the parse tree for the following program [6 Marks]

Module: = statement

statement: = PRINT expression_list

expression_list: = expression | expression COMMA expression_list

expression: = INT | MINUS expression | expression PLUS expression

- c) Describe the term finite automata [4 Marks]

QUESTION FIVE [20 MARKS]

- a) Describe any **THREE** qualities of a good parser [6 Marks]
- b) Describe the term compiler correctness [4 Marks]
- c) State a regular expression for each of the regular sets described below.
- i) All strings of lower-case letters that either begin or end in 'a'. Some example strings in the language: a, accc, abax, abaxa. Note: You may make a regular definition for lower-case letters. [3 Marks]
- ii) All strings of a's and b's that contain no three consecutive b's. Some example strings in the language: abab, abbbaa, eps (the empty string), baabb. [3 Marks]
- iii) Show that the following grammar is ambiguous [4 Marks]

$A \rightarrow A x B$

$\{ x$

$B \rightarrow x B$

$\} x$