(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2020/2021 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: 21 /07/2021 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)

i. Distinguish between an alphabet and a language **[4 Marks]**

ii. Explain the activities that fall in back-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 syntax analyzer **[2 Marks]**

b)

i. Describe Three areas where compiler technology is applied **[6 Marks]**

ii. Describe THREE general tools that have been created for design of compiler component **[6 Marks]**

iii. Explain the purpose of the Symbol table and Error handler in compiler design **[2 Marks]**

QUESTION TWO [20 MARKS]

a) Describe code optimization. **[5 Marks]**

b) Describe the following **[5 Marks]**

i. Recursive descent parsing

ii. Backtracking **[6 Marks]**

c) With the aid of diagram predictive parser **[4 Marks]**

d) Describe the role of an Activation tree

QUESTION THREE [20 MARKS]

a) Determine if the following statements are **TRUE/ FALSE**

i. Finite automata can be used to count the number of symbols read. **[1 Mark]**

ii. In regular expression notation * represents one or more occurrence of the preceding symbol. **[1 Mark]**

iii. NDFA can be converted to DFA using subset construction method **[1 Mark]**

iv. Shift reduce parsing is a type of Top-down design **[1 Mark]**

v. The grammar E -> E+E | E*E | a **[1 Mark]**

vi. Regular expression (0+1) * recognises set of all strings over {0,1} **[1 Mark]**

b) With the aid of an example describe directed acyclic graph (DAG). **[2 Marks]**

c) State the properties and uses of directed acyclic graph (DAG). **[2 Marks]**

d) Briefly discuss what the potential advantages/disadvantages are of bottom-up versus a top-down parser generator. **[6 Marks]**

e) Describe the TWO ways intermediate codes cand be represented **[4 Marks]**

QUESTION FOUR [20 MARKS]

a) With the aid of a relevant example describe the stack implementation of shift reduce 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 algorithm for calculation of first set **[4 Marks]**

QUESTION FIVE [20 MARKS]

a) Outline SIX semantic errors that the semantic analyzer is expected to recognize **[6 Marks]**

b) With the aid of diagram describe language processing system. **[4 Marks]**

c) Give 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, abbaaa, eps (the empty string), baabb. **[3 Marks]**

iii) Show that the following grammar is ambiguous **[4 Marks]**

A --> A x B

| x

B --> x B

| x