UNIVERSITY EXAMINATIONS
2023/2024 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: 14/12/2023 TIME: 14:00 HRS – 16:00 HRS

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

c) With the aid of diagram predictive parser [6 Marks]

d) Describe the role of an Activation tree [4 Marks]

QUESTION THREE [20 MARKS]

a) Determine if the following statements are **TRUE/ FALSE** [6 Marks]

i. Finite automata can be used to count the number of symbols read.

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

iii. NDFA can be converted to DFA using subset construction method

iv. Shift reduce parsing is a type of Top down design

v. The grammar E –> E+E | E*E | a

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). [4 Marks]

c) State the properties and uses of directed acyclic graph (DAG).

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 [4Marks]

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