MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF COMPUTING AND INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE

UNIVERSITY ORDINARY EXAMINATION

2020/2021 ACADEMIC YEAR

SECOND YEAR **FIRST** SEMESTER EXAMINATION FOR BACHELOR OF COMPUTER SCIENCE AND BACHELOR OF COMPUTER TECHNOLOGY

SCS 201 – THEORY OF COMPUTATION

DURATION: 2 HOURS

Instructions to candidates:

1. Answer question One and Any Other Two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

a) Give a brief description of the following terms (5 marks)
   i. Automata theory
   ii. Grammar
   iii. Token
   iv. LEXIME
   v. Language

b) Discuss three areas where theory of computation can be applied (6 marks)

c) Explain the difference between non-deterministic finite automata (NFA) and deterministic finite automata (DFA). (6 marks)

d) Define push down automata and explain three components of push down automata. (8 marks)

e) Explain the rule used in context free grammar. (5 marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

a) (i) Define regular expression. (1 mark)
   (ii) Explain the properties of regular expression. (3 marks)

b) Assume $L = \{W\}$ where W is a binary string containing O,1 as a substring
   i. Explain the step for building a DFA to recognize a language. (4marks)
   ii. From above calculate accepting state (F). (6 marks)
   iii. Generate a translation table for above language. (6 marks)

QUESTION THREE (20 MARKS)

a) Explain the difference between the following (6 marks)
   i. Recognizers and generators
   ii. Context free grammar and Backus-Naur form (BNF)

b) The syntax analysis portion of a language processor consists of two parts. Discuss the two parts of syntax analysis. (6 marks)

c) Explain three advantages of using BNF to describe syntax. (3 marks)

d) Determine five reasons for separating lexical and syntax analysis. (5 marks)

QUESTION FOUR (20 MARKS)

a) Let $X = (O_x, d_x, Q_0, f_x)$ be an NDFA which accepts the language $L(X)$. We have to design an equivalent DFA $Y = (Q_y, \sum \quad, d_y, Q_0, F_y)$ such that $L(Y) = L(X)$. Describe the steps of converting NDFA to its equivalent DFA. (8 marks)

b) Using a diagram, describe Chomsky classification of grammar and describe four types of grammar. (10 marks)

c) Explain two types of Turing machines. (2 marks)