



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

SECOND YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)

SCO 211: AUTOMATA THEORY

DATE: 23/3/2021

TIME: 8.30-10.30 AM

INSTRUCTION: Answer Question ONE and any other TWO Question

QUESTION ONE (30 MARKS) COMPULSORY)

- a) Define the following
 - i. Alphabet (1 mark)
 - ii. String (1 mark)
 - iii. Automata (1 mark)
 - b) In theory of computation, what is the meaning of the following
 - i. Acceptors (2 marks)
 - ii. Classifiers (2 marks)
 - iii. Transducers (2 marks)
 - c) Distinguish between Pushdown automaton (PDA) and Linear bounded automaton (LBA) (4 marks)
 - d) List down components of a DFA (5 marks)
 - e) Name any THREE operators associated with Language Processing in Automata theory (3 marks)
 - f) Compare DFA to NFA(NDFA) (5 marks)
 - g) Give reasons why we study AUTOMATA (4 marks)
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QUESTION TWO (20 MARKS)

- a) Given $\Sigma = \{0, 1\}$ Construct a NFA that recognizes ALL
- i. strings in which every 1 is immediately followed by 00; (5 marks)
 - ii. strings that contain both 010 and 101 as substrings; (5 marks)
 - iii. Strings that end with 00. (5 marks)
- b) Describe applications of AUTOMATA (5 marks)

QUESTION THREE (20 MARKS)

Given $\Sigma = \{a, b\}$

- a) Construct the DFA for the Language in which every “a” is either immediately preceded by or immediately followed by “b” (5 marks)
- b) List any 4 Strings in the Language (5 marks)
- c) List any 3 Strings NOT in the Language (5 marks)
- d) Construct a transition table for the problem above (5 marks)

QUESTION FOUR (20 MARKS)

Answer the following questions about Moore Machines

- a) Provide a formal definition if a Moore Machine (5 marks)
- b) Draw the transition table of the machine (5 marks)
- c) Sketch a diagram to represent the machine (5 marks)
- d) Compare Mealy to Moore Machine (5 marks)

QUESTION FIVE (20 MARKS)

- a) What is a deterministic finite automata machine? (4 marks)
- b) The following is the transition table of a Moore Machine. Convert it to a Mealy Machine by providing the equivalent transitions table (8 marks)

Present State	Next State		Output
	a = 0	a = 1	
a	d	b	1
b	a	d	0
c	c	c	0
d	b	a	1

- c) Construct a DFA for ALL strings over $\{a, b\}$ That begin and end with the same symbol (8 marks)