



# MASENO UNIVERSITY

## UNIVERSITY EXAMINATIONS 2010/2011

### THIRD YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE & TECHNOLOGY

#### SCS 304: AUTOMATA

*Date: 1<sup>st</sup> December, 2010*

*Time: 9.00 – 11.00 a.m.*

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#### INSTRUCTIONS:

- ♦ Attempt ALL questions in Section A and any other TWO questions in Section B.



**Section A**

**Question 1**

- a. Given the NFA below show whether the string 00101 is accepted or not ( 7 marks)



- b. Find out the state the NFA would be in after accepting string 001 ( 8 Marks)

- c. in order to convert the NFA drawn below to a DFA Draw the transitions table showing all the details ( 8 marks)



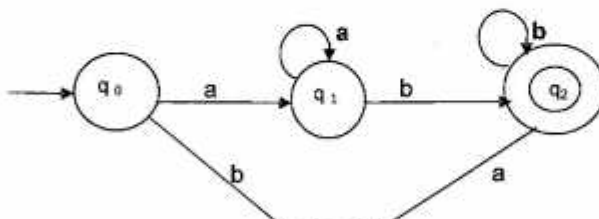
- d. Draw the Transition diagram of a DFA from the NFA have described above (7 Marks)

**Section B**

**Answer any two questions from this section**

**Question 2**

- a. Find the regular expression that corresponds to the following DFSA given in the figure below ( 10 marks)



- b. Draw an NFA to accept all numbers ( 10 marks)



- 123
- 123.0
- +123
- +123.9876
- -123
- -123.89765 etc

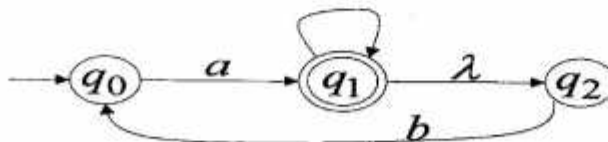
**Question 3**

Consider the DFA that would accept the language  $L = \{ w \mid w \text{ has both an even number of 0's and even number of 1's} \}$

- i. Specify the DFA for the language L, ( 2 marks)
  - ii. Draw the DFA obtained by the specifications above (5 marks)
  - iii. Draw the transition table for the DFA obtained above ( 4 marks)
- a. Let  $g = (N, T, P)$  where  $N = \{S\}$ ,  $T = \{a,b\}$  P consist of the following rules
    - b.  $S \rightarrow aS$
    - c.  $S \rightarrow bS$
    - d.  $S \rightarrow \epsilon$
  - c. Show how the string **baabba** is generated and show that this grammar generates all strings in  $T^*$  (9 marks)

**Question 4 (20 Marks)**

- a) Convert the following **Regex** to a epsilon- NFA  $(0+1)^*1(0+1)$  (5 MARKS)
- b) Convert the NFA below to an accepting DFA ( 5 MARKS)



- c) Derive the following expression  $x + (x + y000)$  from E in the grammar below (10 MARKS)
1.  $E \rightarrow I$



- 2.  $E \rightarrow E+E$
- 3.  $E \rightarrow E^*E$
- 4.  $E \rightarrow (E)$
- 5.  $I \rightarrow x$
- 6.  $I \rightarrow y$
- 7.  $I \rightarrow Ix$
- 8.  $I \rightarrow Iy$
- 9.  $I \rightarrow IO$
- 10.  $I \rightarrow I1$

**Question 5 ( 20 Marks)**

- a) Construct the left most derivation of a tree that derives the expression in 4c above  
( 8 MARKS)
- b) Construct the parse trees for the expression  $b + b * b$  and derive the ambiguity in the expression  
( 7 MARKS)
- c) Consider  $L \{a^n b^n c^m d^m : n \geq 1, m \geq 1\} \cup \{a^n b^m c^m d^n : n \geq 1, m \geq 1\}$

- A grammar for L is
- $S \rightarrow AB / C$
  - $A \rightarrow aAb / ab$
  - $B \rightarrow cBd / cd$
  - $C \rightarrow aCd / aDd$
  - $D \rightarrow bDc / bc$

Show that L is ambiguous when passing the string ***aabbccdd***, by drawing the parse trees and the two leftmost derivations  
( 5 MARKS)

