MIDTERM EXAM SHEET

Name:
StudentID:

Instructions

You have 90 minutes to complete the exam. Answer Parts A and B.

Part A: The multiple selection questions in are worth 40% in total and are each worth the same amount. The score of a is calculated using the following formula:
((#selected correct answers - #selected incorrect answers)/ Total # of corrected answer)
*Total#of points
Use the special answer sheet for Part A.

Part B: Part B contains FOUR questions. Answer any THREE. Each is worth 20%. You may use the back of the exam sheets if you need extra space.
The test will be closed-book.You are not allowed to use laptops too. However, you are allowed to bring my slides with review notes.

PART A: MULTIPLE SELECTION QUESTIONS

Question 1: *A given grammar is called ambiguous if*

A. two or more productions have the same non-terminal on the left-hand side
B. a derivation tree has more than one associated sentence
C. there is a sentence with more than one derivation tree (parse tree) corresponding to it
D. brackets are not present in the grammar
E. it has two left most derivations
F. it has two right most derivations

Question 2 : a^+ *means*

A. {ε, a, aa,...}
B. {a,aa,..}
C. {a,aa,aaa,aaa}
D. aa*
E. a*a
F. {a}

Question 3: *Which of the following statement are correct?*

A. Any regular language can be generated by a context-free grammar
B. Some non-regular languages cannot be generated by any context-free grammar
C. the intersection of two a regular languages is a regular languages
D. All non-regular languages can be generated by context-free grammars.

Question 4: *A derivation of a string w of length n in a context-free grammar*

A. must involve exactly $2n - 1$ applications of rules for all n.

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B. must involve exactly $2n - 1$ applications of rules, except possibly when $n \leq 5$.
C. must involve at least n rules, but can involve an arbitrarily large number.
D. must involve at least n rules and at most 2n rules.
E. can involve any positive integer number of rules.

Question 5 *Which of the following are incorrect for push down automata?*

A. Non – Deterministic pushdown automata are not more powerful than Deterministic pushdown automata.
B. Regular languages can be recognized by pushdown automata.
C. Every Non-Deterministic pushdown automata can be transformed into its equivalent Deterministic pushdown Automata .
D. Pushdown automata has the additional stack for storing long sequence of alphabets.
E. Any push down automaton gives acceptance of input strings by going up to empty stack and final states.

Question 6.*Which of the following components are not in formal definition of a DFA*

A. Transition function
B. Empty string
C. Set of states
D. Stack alphabet
E. Configuration

Question 7: *Which computation models can decide if a string in a Context Sensitive Language?*

A. Linear Bounded Automaton
B. Turing Machine
C. Pushdown Automaton
D. Finite State Automaton

Quesstion 8:*Which of the following grammars are in Chomsky Normal Form:*

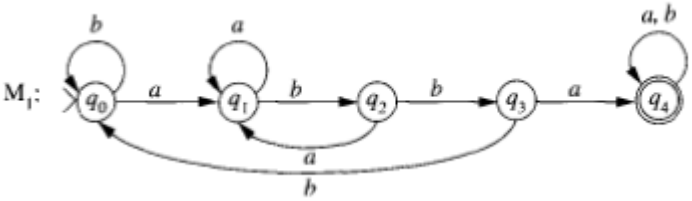
A. $S \rightarrow AB \mid BC \mid CD, A \rightarrow 0, B \rightarrow 1, C \rightarrow 2, D \rightarrow 3$
B. $S \rightarrow AB, S \rightarrow BC \mid 1, B \rightarrow BS \mid 1, C \rightarrow 1213$ (
C. $S \rightarrow ABa, A \rightarrow aab, B \rightarrow Ac$
D. $S \rightarrow EF \mid AF \mid EB \mid AB, X \rightarrow AY \mid BY \mid a \mid b, Y \rightarrow AY \mid BY \mid a \mid b \mid c, E \rightarrow AX, F \rightarrow BX, A \rightarrow a, B \rightarrow b, C \rightarrow c$

Question 9: *Which of the following languages are not regular?*

A. $\{ww \mid w \in \{0,1\}^*\}$
B. The set of strings over {a,b,c}where there is no c anywhere to the left of a
C. The set of strings over {0,1}with an even number of 1 and even number of 1's
D. The set of strings over {0,1}with number of 0's not less than number of 1's

Question 10:

Consider the following DFA.The automaton accepts



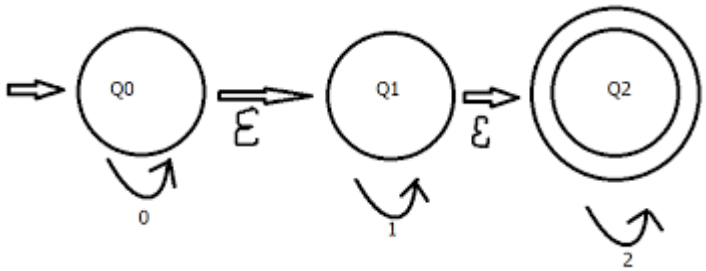
A. all strings over {a,b} that contain the substring abbb
B. all strings over {a,b} that contain the substring abba
C. all strings over {a,b} that contain the substring baba
D. all strings over {a,b} that contain the substring babba

ANSWER SHEET FOR PART A

QUESTION NUMBER	CORRECT ANSWERS
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

PART B: ANSWER QUESTIONS

1/Let N be the following nondeterministic finite automaton.



a) Write the formal definition of N
b) Describe the language accepted by N
c) Convert N to the equivalent DFA: D

2/ Convert regular expression ab* + b to its equivalent NFA

3/ Remove ε-rules from the following grammar

$S \rightarrow (S) \mid SS \mid \varepsilon$

4/ Prove that language $L = \{a^n b^{2n} \mid n \geq 0\}$ is not regular.

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