Course Examinations 1998 - 99

Course Code & Title : ...csc 3130 Formal Languages and Automata Theory.................................

Time allowed : ....2..........hours...........0........... minutes

Student I.D. No. : .... Seat No. :............................

Answer all the questions.

1.	Consider the language L over $\Sigma=\{a, b\}$ where
	$L = \{\omega \mid (\omega \in \Sigma^*) \cap (\omega$ has no consecutive a's nor b's) $\cap (\omega$ ends with a "b")$\}$
	(a) Write a regular expression for L. (6%)
	(b) Construct a DFA accepting L. (7%)
	(c) Construct from the DFA in (b), or otherwise, a DFA for $\bar{L}$. (6%)
	(d) We define the prefix of L, denoted by pfx(L), as follows:
		$pfx(L) = \{\omega \mid (\omega \in \Sigma^*) \cap (\exists x \in \Sigma^*$ such that $\omega x \in L)\}$
		Construct from the DFA in (b), or otherwise, a DFA for pfx(L). (6%)

2.	Consider the grammar G:
	$S \rightarrow aXd \mid Sd \mid aSd$
	$X \rightarrow bc \mid bX \mid bXc$
	(a) Describe the language generated by G. (6%)
	(b) Write G in Chomsky Normal Form. (6%)
	(c) Write G in Greibach Normal Form. (Hint: You can start from the original grammar G, instead of from its CNF constructed in (b).) (7%)
	(d) Use the result in (c) or otherwise, write a PDA for G. (6%)

3.	Consider the language L over $\Sigma=\{a, b, c\}$ where $L = \{a^i b^j c^k \mid i \le j \le k\}$
	(a) Is L a regular language? Write a regular expression, or prove that it is not. (8%)
	(b) Is L a context free language? Give a CFG, or prove that it is not. (9%)
	(c) Is L recursive? Give a Turing machine accepting L, or prove that it is not. (8%)

4.	Consider the grammar G:
	$S \rightarrow AC$
	$A \rightarrow ab \mid aAb$
	$C \rightarrow cd \mid cCd$
	(a) Is G a deterministic CFG? Construct a DPDA, or prove that it is not. (5%)
	(b) Does the language generated by G, denoted by L(G), have the prefix property? Explain. (5%)
	(c) Is G a LR(0) grammar? Explain. (3%)
	(d) Give all the LR(0) items of G. (7%)
	(e) Show how the string "aabbcd" is parsed. (Note: No need to construct the DFA.) (5%)