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Fifth Semester B.E. Degree Examination, June 2012
Formal Languages and Automata Theory

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. Define :
 i) Powers of alphabet
 ii) Strings
 iii) Languages. (06 Marks)
- b. Write DFR for the following :
 i) Set of all string not containing (110)
 ii) Set of all strings with exactly three consecutive O's. (06 Marks)
- c. Convert the following NFA to DFA :

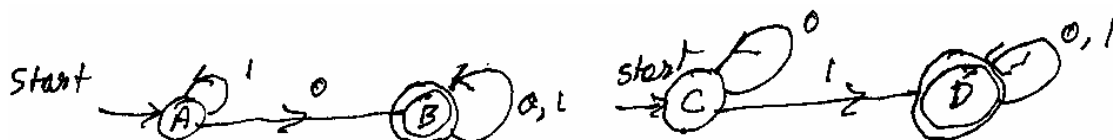
δ	0	1
$\rightarrow q_0$	q_0	q_0, q_1
q_1	q_2	q_2
$*q_2$	ϕ	ϕ

(08 Marks)

- 2 a. For a given E-NFA, compute the following :
 i) Compute E-closure of each state.
 ii) Give the set of all strings of length 3 or less accepted by the automation.
 iii) Convert the automation to DFA. (10 Marks)

δ	\in	Q	b
$\rightarrow p$	$\{r\}$	$\{q\}$	$\{p, r\}$
q	ϕ	$\{p\}$	ϕ
$*r$	$\{p, q\}$	$\{r\}$	$\{p\}$

- b. Prove that every language defined by RE is also defined by some finite automata. (06 Marks)
- c. Explain about text search for address pattern. (04 Marks)
- 3 a. If L and M are regular languages prove that $L \cap M$ is also regular. (03 Marks)
- b. Consider the homomorphism from the alphabet $\{0, 1, 2\}$ to $\{a, b\}$ defined by $h(0) = ab$, $h(1) = b$, $h(2) = aa$
 i) What is $h(2201)$?
 ii) If L is language $1^* 02^*$ what is $h(L)$?
 iii) If L is the language $(ab + baa)^* bab$ what is $h^{-1}(L)$. (09 Marks)
- c. Construct the product of DFA. (08 Marks)



- 4 a. Design CFG for the following :
Set of all strings of O's and 1's, whose number of O's equal to number of 1's. (06 Marks)
- b. Consider the grammar $S \rightarrow s b s / a$. This grammar is ambiguous: show that particular string aba ba ba has two
- Parse trees
 - Left most derivations
 - Right most derivation. (10 Marks)
- c. Write any one application of CFG with example. (04 Marks)

PART – B

- 5 a. Design a PDA P to accept language L_{ww}^r . Show that how PDA accepts string 1111 with TD. (10 Marks)
- b. Prove that for a PDA P there exist CFG such that $L(G) = N(P)$. (10 Marks)
- 6 a. Consider the grammar
 $S \rightarrow ASB/\epsilon$
 $A \rightarrow aAS/a$
 $B \rightarrow sbs/bb$
 - Eliminate useless symbols
 - Eliminate ϵ - productions
 - Eliminate unit productions
 - Put the grammar into CNF. (10 Marks)
- b. If L_1 and L_2 are CFL, then prove that family of context free languages are closed under union and combination. (10 Marks)
- 7 a. What is Turing machine and multi tape Turing machine? Show that languages accepted by these machines are same. (10 Marks)
- b. Design Turing machine to accept the language consisting of all palindromes of O's and 1's. (10 Marks)
- 8 Write short notes on :
- Recursive languages
 - Post's correspondence problems
 - Universal Turing machine
 - Language that is not recursively enumerable. (20 Marks)

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