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06CS56

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}

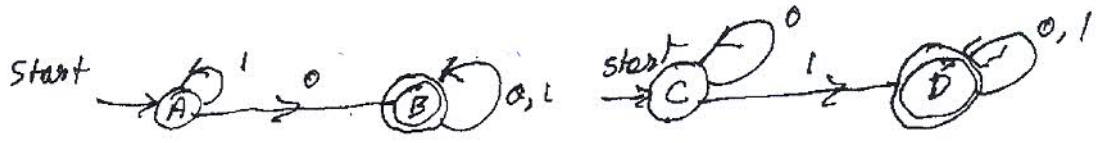
b. Prove that every language defined by RE is also defined by some finite automata. **(06 Marks)**

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 grammer $S \rightarrow s\ b\ s / a$. This grammer is ambiguous: show that particular string aba ba ba has two
i) Parse trees
ii) Left most derivations
iii) 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 grammer
$S \rightarrow ASB/\in$
$A \rightarrow aAS/a$
$B \rightarrow sbs/bb$
i) Eliminate useless symbols
ii) Eliminate $\in$ - productions
iii) Eliminate unit productions
iv) Put the grammer 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 concombination. **(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 :
a. Recursive languages
b. Post's correspondence problems
c. Universal Turing machine
d. Language that is not recursively enumerable. **(20 Marks)**

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