

R07**Set No: 1****Code No: V3127**

III B.Tech. I Semester Supplementary Examinations, April/May - 2013

FORMAL LANGUAGES & AUTOMATA THEORY

(Computer Science and Engineering)

Time: 3 Hours**Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

1. a) Explain the differences between NFA and DFA.? [8M]
b) Design a DFA which accepts all strings which are ending with 101 over an Alphabet {0,1} [8M]
2. Construct Minimum state Automata for the following DFA? [16M]
Where * denotes final state

δ	0	1
q 1	q2	q6
q 2	q1	q3
*q 3	q2	q4
q 4	q4	q2
q5	q4	q5
*q6	q5	q4

3. Give a regular expression for the set of all strings over {a, b} accepting all strings which have number of a's divisible by 6 and number of b's divisible by 8.? [16M]
4. a) Define Grammar? Explain about Chomsky Classification of Grammars? [8M]
b) Explain about Right and Left Linear Grammars? [8M]
5. a) Reduce the Grammar G given by
 $S \rightarrow aAa$, $A \rightarrow Sb/bcc/DaA$
 $C \rightarrow abb/DD$, $E \rightarrow ac$, $D \rightarrow Ada$
into an equivalent grammar by removing useless symbols and useless productions from it?
b) Convert the following grammar into CNF.
 $S \rightarrow aAD$
 $A \rightarrow aB/bAB$
 $B \rightarrow b$
 $D \rightarrow d$. [8M+8M]
6. a) Show that for every PDA then there exists a CFG such that $L(G)=N(P)$? [8M]
b) Construct a PDA for $L=\{a^n b^n c^n / n > 0\}$ [8M]
7. a) Define Turing Machine? Explain about the Model of Turing Machine? [8M]
b) Give a Turing machine that computes ones complement of a binary number? [8M]
8. a) Explain about Deterministic context free language and Deterministic PDA.? [8M]
b) Show that $L=\{a^n b^n c^n : n \geq 1\}$ is a CSL. ? [8M]

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1. Design DFA for the following over {a,b}. [16M]
 a) All string containing not more than three a's. ?
 b) All strings that has at least two occurrences of b between any two occurrences of a.?

2. Construct Minimum state Automata for the following DFA? [16M]
 Where * denotes final state

δ	0	1
q 1	q2	q3
q 2	q3	q5
*q 3	q4	q3
q 4	q3	q5
*q5	q2	q5

3. a) Construct Finite Automata for the regular Expression $1(01+10)^*00?$ [10M]
 b) Show that $L=\{a^{2n}/n<0\}$ is Regular? [6M]
4. a) Construct a derivation tree for the string abcd from the grammar $B,A \rightarrow bc, B \rightarrow d, C \rightarrow cd$?
 b) Define Derivation tree? Explain about LMD and RMD? [8M+8M]
5. a) What do you mean by ambiguity? Show that the grammar $S \rightarrow S/S, S \rightarrow a$ is ambiguous ?
 b) Show that the grammar G with production
 $S \rightarrow a/aAb/abSb$
 $A \rightarrow aAAb/bS$ is ambiguous. [8M+8M]
6. a) Explain about PDA? [4M]
 b) Convert the grammar $S \rightarrow 0AA, A \rightarrow 0S/1S/0$ to a PDA that Accepts the same Language by Empty Stack? [12M]
7. Give a Turing machine for the following:
 b) Given $= \{0,1\}$, design a Turing machine that accepts the language denoted by the regular expressions $00?$ [8M]
 b) That shifts the input string, over the alphabet (0,1) by one position right by inserting '#' as the first character. ? [8M]
8. a) What is decidability? Explain any two un-decidable problems? [8M]
 b) Show that if L and L? are recursively enumerable, and then L is recursive.? [8M]

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Answer any FIVE Questions
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1. Construct DFA for the following [16M]
 - a) $L = \{w/w \text{ has both an even number of } 0\text{'s and even number of } 1\text{'s}\}$?
 - b) $L = \{w/w \text{ is in the form of 'x01y' for some strings } x \text{ and } y \text{ consisting of } 0\text{'s and } 1\text{'s}\}$?
2. a) Design a Moore Machine to determine the residue mod 4 for each binary string treated as integer? [8M]
 - b) Design a Mealy machine that uses its state to remember the last symbol read and emits output 'y' whenever current input matches to previous one, and emits n otherwise. ? [8M]
3. Give the English description and NFA for the following regular expressions.
 - a) $r = (1+01+001)^*(+0+00)$ [8M]
 - b) $r = [00+11+(01+10)(00+11)^*(01+10)]^*$ [8M]
4. a) Obtain a regular grammar to obtain the set of all strings not containing three consecutive a' s.? [8M]
 - b) Obtain a CFG to generate the set of all strings over alphabet $\{0,1\}$ with exactly twice as many 0's as 1's. ? [8M]
5. a) List out the Applications of CFL? [8M]
 - b) Construct CNF for the Grammar $S \rightarrow ABC, A \rightarrow 0B, B \rightarrow CD/0, C \rightarrow 1$ [8M]
6. Let G be the grammar given by

$$S \rightarrow aABB/aAA, \quad A \rightarrow aBB/a, \quad B \rightarrow bBB/A$$
 Construct the PDA that accepts the language generated by this grammar G. [8M]
 - b) Define Deterministic pushdown automata. Explain with an example. ? [8M]
7. a) Design a Turing Machine that accepts the set of all even palindromes over $\{0,1\}$? [8M]
 - b) Explain about Recursively Enumerable Languages? [8M]
8. a) Find whether the post correspondence problem $P = \{(10,101), (011,11), (101,011)\}$ has a match. Give the solution? [8M]
 - b) Explain Turing reducibility machines? [8M]

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FORMAL LANGUAGES & AUTOMATA THEORY

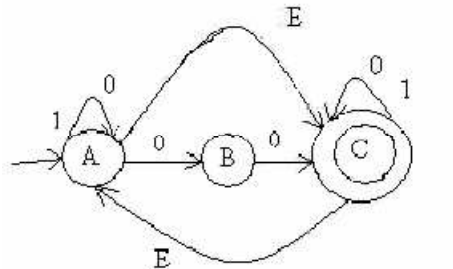
(Computer Science and Engineering)

Time: 3 Hours**Max Marks: 80**

Answer any FIVE Questions

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1. a) Design a Moore machine to determine the residue mod 5 for each ternary string (base 3) treated as ternary integer.? [8M]
b) Define Finite Automaton? Explain about the model of Finite Automaton? [8M]
2. Construct DFA for given Fig.1 NFA with ϵ -moves. [16M]



3. Find a Regular expression corresponding to each of the following subsets over $\{a,b\}^*$.
 - a) The set of all strings containing no three consecutive a's. [16M]
 - b) The set of all strings where the 10th symbol from right end is a b. [8M]
 - c) The set of all strings over $\{a,b\}$ having even number of a's & odd number of b's. [8M]
 - d) The set of all strings over $\{a,b\}$ in which the number of occurrences of a is divisible by 3. [8M]
4. a) Obtain a CFG to generate unequal number of 0's and 1's.? [8M]
b) Obtain a CFG to obtain balanced set of parentheses.(i.e every left parentheses should match with the corresponding right parentheses). ? [8M]
5. Define Ambiguous Grammar? Check whether the grammar $\rightarrow aAB, A \rightarrow bC/cd, C \rightarrow cd, B \rightarrow c/d$ Is Ambiguous or not? [16M]
6. a) Explain in brief about Push Down Automata and context free language? [8M]
b) Let G be a CFG with the following productions.
 $S \rightarrow a B c$ $A \rightarrow a b c$ $B \rightarrow a A b$ $C \rightarrow A B$ $C \rightarrow c$
 Construct a PDA M such that the language generated by M and G are equivalent. ? [8M]
7. a) Design a Turing Machine for $L = \{0^n 1^m 0^n / m, n \geq 1\}$? [8M]
b) Explain about the Design of Turing Machines? [8M]
8. a) Explain about the Decidability and Un-decidability Problems? [8M]
b) Explain about Turing Reducibility? [8M]
