

III B.Tech I Semester Examinations, MAY 2011
FORMAL LANGUAGES AND 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 terms: Chomsky normal form and Greibach Normal form
 (b) Convert to Chomsky normal form the following grammar: $G = (N, T, P, S)$
 where
 $N = \{S, A, B\}$
 $T = \{a, b\}$
 $P = \rightarrow \{S \rightarrow aB$
 $S \rightarrow bA$
 $A \rightarrow aS$
 $A \rightarrow b A A$
 $A \rightarrow a$
 $B \rightarrow a B B$
 $B \rightarrow b\}$ [8+8]

2. (a) Design a DFA for the language $L = \{ba^n/n \geq 0\}$.
 (b) Design DFA over $\{a,b\}$ to accept strings which does not contains two consecutive b's. [8+8]

3. (a) Describe Chomsky hierarchy of languages.
 (b) Explain post Correspondence Problem. [8+8]

4. (a) Define a Turing machine mathematically. Define the term 'move' in a TM.
 (b) Design a TM that recognizes the set $\{0^{2n}1^n \geq |n = 0\}$. [16]

5. (a) $S \rightarrow aS | bS | a | b$
 Generate the regular expression for the above CFG
 Give automata for the above grammar and write what is the language accepted by the above automata? Is both the derived automata and the given CFG generates same language.
 (b) $S \rightarrow aSbS | bSaS | \epsilon$
 What is the language generated by the above grammar? [2×8]

6. Is Arden's lemma is applicable to an NFA consisting with ϵ -moves? If not? Then why? Explain. [16]

7. (a) Design a Moore Machine to determine the residue mod 4 for each binary string treated as integer.

Code No: R05310501

R05

Set No. 2

(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. [8+8]

8. Find the PDA that accepts the following language

$L = \{x \in \{a, b\}^* : |x|_a = 2|x|_b\}$ via empty stack. Also find the PDA via final state. [16]

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4. (a) Define a Turing machine mathematically. Define the term 'move' in a TM.
 (b) Design a TM that recognizes the set $\{0^{2n}1^n \mid n \geq 0\}$. [16]
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 $L = \{x \in \{a, b\}^* : |x|_a = 2|x|_b\}$ via empty stack. Also find the PDA via final state. [16]
6. (a) Design a DFA for the language $L = \{ba^n \mid n \geq 0\}$.
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8. (a) Explain the terms: Chomsky normal form and Greibach Normal form
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R05

Set No. 4

$S \rightarrow bA$
 $A \rightarrow aS$
 $A \rightarrow b A A$
 $A \rightarrow a$
 $B \rightarrow a B B$
 $B \rightarrow b\}$

[8+8]

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R05

Set No. 1

- (b) Design a TM that recognizes the set $\{0^{2n}1^n \mid n \geq 0\}$. [16]
8. (a) Design a DFA for the language $L = \{ba^n \mid n \geq 0\}$.
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R05

Set No. 3

8. (a) Design a Moore Machine to determine the residue mod 4 for each binary string treated as integer.
- (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. [8+8]
