Code No: 07A50501 **R07** **Set No. 2**

**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**

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1. (a) If G=({S}, {0, 1}, {S→0S1, S→ $\varepsilon$}, S), find L(G).
   (b) If G=({S}, {a}, {S→SS}, S) find the language generated by G. [8+8]

2. Convert the following grammar to Greibach Normal Form G = ({A1, A2, A3}, {a,b},P,A)
   Where P consists of the following
   A1→A2 A3
   A2→A3 A1 | b
   A3→A1 A2 | a [16]

3. (a) Design Push Down Automata for L={$0^n1^{2n}$ | n $\geq$ 1}by final state method.
   (b) Draw the transaction diagram for above language L. [12+4]

4. (a) Show that there exist no finite automaton accepting all palindromes over {a , b}.
   (b) Show that {$a^nb^n$ | n > 0} is not a regular set without using the pumping lemma. [8+8]

5. (a) Construct a NFA accepting {ab, ba} and use it to find a deterministic automaton accepting the same set.
   (b) M = ({q1, q2, q3}, {0, 1}, $\delta$, q1, {q3}) is a NFA where $\delta$ is given by
   $\delta$ (q1, 0) = {q2, q3}, $\delta$ (q1, 1) = q1
   $\delta$ (q2, 0) = {q1, q2 $\delta$(q2, 1) =$\emptyset$
   $\delta$(q3, 0) = {q2}, $\delta$(q3, 1) = {q1, q2}
   construct an equivalent DFA. [8+8]

6. Design Turing Machine for L = { $0^n$ $1^n$ $0^n$ | n $\geq$ 1 }. [16]

7. Construct LR(0) items for the grammar given find it's equivalent DFA
   S → aSA | b
   A → Ab | a [16]

8. (a) Construct a Deterministic acceptor equivalent to M=({$q_0$, $q_1$,$q_2$},{a,b},$\delta$,$q_0$,{$q_2$}) and $\delta$ is given in table (figure 1).
   (b) Construct a Moore machine equivalent to the Mealy machine M given in table. [8+8]

| States/$\Sigma$ | a | b |
|---|---|---|
| $\rightarrow q_0$ | $\{q_0, q_1\}$ | $q_2$ |
| $q_1$ | $q_0$ | $q_1$ |
| $q_2$ | - | $\{q_0, q_1\}$ |

figure - 1

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Code No: 07A50501 **R07** **Set No. 4**

Figure 1:

**III B.Tech I Semester Examinations,MAY 2011**
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**Answer any FIVE Questions**
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1. Explain the following
   (a) Multi - tape Turing Machine
   (b) Multi - dimensional Turing Machine
   (c) Multi - head Turing Machine. [6+5+5]

2. State and explain about closure properties of Context Free Languages. [16]

3. (a) Differentiate Moore and Mealy machines
   (b) Define NFA with $\varepsilon$ - moves.
   (c) Construct a Mealy machine which can output EVEN, ODD according as the total number of 1's encountered is even or odd. The input symbols are 0 and 1. [5+4+7]

4. (a) Let G be the grammar. S→ aS | aSbS | $\varepsilon$. Prove that L(G) = {x | such that each prefix of x has atleast as many a's as b's}
   (b) Show that {abc, bca, cab} can be generated by a regular grammar whose terminal set is {a, b, c} [8+8]

5. (a) Give NFA accepting the set of all strings of 0's and 1's such that the 10th symbol from the right is a 1.
   (b) Give DFA accepting the set of all strings with 3 consecutive 0's over the alphabet $\{0, 1\}$.
   (c) Define Finite Automata. Give an example. [6+5+5]

6. Convert the following grammar to Chomsky Normal Form
   S→ABA
   A→ aA | $\varepsilon$
   B→ bB | $\varepsilon$ and simplify the grammar [16]

7. Construct LR(0) items for the grammar given find it's equivalent DFA.
   S' $\rightarrow$ S
   S $\rightarrow$ AS | a
   A $\rightarrow$ aA | b [16]

8. Using pumping lemma show that the following sets are not regular:
   (a) $\{a^n b^{2n} \mid n > 0\}$
   (b) $\{a^n b^m \mid 0<n<m\}$ [8+8]

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Code No: 07A50501 **R07** **Set No. 1**

**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**
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1. Find regular expressions representing the following sets
   (a) the set of all stings over {0, 1} having at most one pair of 0's or atmost of one pair of 1's
   (b) the set of all strings over {a, b} in which the number of occurrences of a is devisible by 3
   (c) the set of all strings over {a, b} in which there are at least two occurrences of b between any two occurrences of a.
   (d) the set of all strings over {a, b} with three consecutive b's.
   [16]
2. Explain halting problem of Turing Machine. [16]
3. What are type 0, 1, 2, 3 grammars? Compare them in different aspects. [16]
4. (a) Construct NFA accepting the set of all strings over an alphabet {0, 1} of 0's and 1's such that the 10th symbol from the right end is a 1. Construct DFA equivalent to this NFA.
   (b) Construct NFA accepting the set of all strings over an alphabet {0, 1} such that every block of 5 consecutive symbols contains at least two 0's. Construct DFA equivalent to this NFA. [8+8]
5. (a) Convert the following grammar to Greibach Normal Form
   S→ SS
   S→0S1 | 01
   (b) Show that grammar is ambiguous
   S→aSbS | bSaS | $\varepsilon$ [8+8]
6. State and explain the properties of DCFL. [16]
7. (a) Consider the Finite State Machine whose Transition function $\delta$ is given in the form of a transition table (figure 2). Here, Q = $\{q_0,q_1,q_2,q_3\}$, $\Sigma = \{0,1\}$, F=$\{q_0\}$. Give the entire sequence of states for the inputstring 110001.
   Transition Table:
   (b) Let M = $(Q,\Sigma,\delta, q0, F)$ be a finite automaton. Let R be a relation in Q defined by $q_1$ R $q_2$ if $\delta$ $(q_1,a)=\delta(q_2,a)$ for some $a \in \Sigma$. Is R an equivalence relation?
   [8+8]

| States | Input | |
|---|---|---|
| | 1 | 0 |
| $q_0$ | $q_2$ | $q_1$ |
| $q_1$ | $q_3$ | $q_0$ |
| $q_2$ | $q_0$ | $q_3$ |
| $q_3$ | $q_1$ | $q_2$ |

Figure 2:

8. (a) Find the language generated by the grammar. $S \to 0A \mid 1S \mid 0 \mid 1$, $A \to 1A \mid 1S \mid 1$

   (b) Construct context-free grammars to generate the set $\{a^l b^m c^n \mid$ one of l, m, n equals 1 and the remaining two are equal$\}$. [8+8]

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Code No: 07A50501 **R07** **Set No. 3**

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**FORMAL LANGUAGES AND AUTOMATA THEORY**
**Computer Science And Engineering**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

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1. What is meant by Chomsky hierarchy of languages. Explain the relations between different types of languages. [16]

2. Explain about various types of Turing Machine. [16]

3. (a) State and explain pumping lemma for CFL.
   (b) Show that L $=\{a^n\ b^n\ c^n \mid n \geq 1\}$ is not CFL. [8+8]

4. (a) Draw the transition diagram of a FA which accepts all strings of 1's and 0's in which both the number of 0's and 1's are even.
   (b) Construct NFA which accepts the set of all strings over $\{0, 1\}$ in which there are at least two occurrences of 1 between any two occurrences of 0. Construct DFA for the same set. [8+8]

5. (a) Construct a NFA accepting {ab, ba} and use it to find a deterministic automaton accepting the same set.
   (b) M = ({q1, q2, q3}, {0, 1}, $\delta$, q1, {q3}) is a NFA where $\delta$ is given by
   $\delta$ (q1, 0) = {q2, q3}, $\delta$ (q1, 1) = {q1}
   $\delta$ (q2, 0) = {q1, q2}, $\delta$ (q2, 1) = $\emptyset$
   $\delta$ (q3, 0) = {q2}, $\delta$ (q3, 1) = {q1, q2}
   construct an equivalent DFA. [8+8]

6. (a) Construct a grammar generating L = $\{wcw^R \mid w\ \varepsilon\ \{a, b\}^*\}$.
   (b) Find a CFG with no useless symbols equivalent to
   S → AB | CA, A→a, B→BC | AB, C→aB | b [8+8]

7. Let value (x) be the result when the symbols of x are multiplied from left to right according to the table given.
   (a) Is L= {xy | $|x|=|y|$ and valule(x)=value(y)} regular?
   (b) Is L = {xy | valule(x)=value(y)} regular? [8+8]

| | a | a | c |
|---|---|---|---|
| a | a | a | c |
| b | c | a | b |
| c | b | c | a |

8. Construct Push Down Automata which can accept the language
   L={X, aXa, bXb, aaXaa, abXab, bbXbb, aaaXaaa, ................}. [16]

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