Code No: R09220504 **R09** **Set No. 2**

II B.Tech II Semester Examinations,APRIL 2011
FORMAL LANGUAGES AND AUTOMATA THEORY
Computer Science And Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Construct DFA and NFA accepting the set of all strings not containing 101 as a substring.
   (b) 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.
   (c) Define NFA with an example. [6+5+4]

2. Discuss about
   (a) Context Free Grammar
   (b) Left most derivation
   (c) Right most derivation
   (d) Derivation tree. [15]

3. (a) If G=({S}, {0, 1}, {S→0S1, S→ ε}, S), find L(G).
   (b) If G=({S}, {a}, {S→SS}, S) find the language generated by G. [7+8]

4. (a) What is unrestricted grammar? Give an Example.
   (b) Explain the language generated by unrestricted grammar.
   (c) Write about the machine corresponding to unrestricted grammar. [5+5+5]

5. (a) Construct a DFA with reduced states equivalent to the regular expression 10 + (0 + 11)0* 1.
   (b) Prove (a + b)* = a*(ba*)* [7+8]

6. (a) 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.
   (b) Construct Moore machine equivalent to Mealy machine described in (a).[8+7]

7. (a) Convert the following Push Down Automata to Context Free Grammar
   M= ({q0,q1},{a,b}{z0,za},δ,q0,z0,φ)
   δ is given by
   δ (q0,a,z0)=(q0,za z0)
   δ (q0,a,za) =(q0,za za)
   δ (q0,b,za) =(q1,ε)
   δ (q1,b,za) =(q1,ε)
   δ (q1, ε,z0) =(q1,ε)

(b) Write the corresponding language for above Push Down Automata. [13+2]

8. Design Turing Machine to increment the value of any binary number by one. The out put should also be a binary number with value one more the number given. [15]

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Code No: R09220504 **R09** **Set No. 4**

II B.Tech II Semester Examinations,APRIL 2011
FORMAL LANGUAGES AND AUTOMATA THEORY
Computer Science And Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define NFA with ε moves.
   (b) differentiate Moore and Mealy machines.
   (c) Write the steps in minimization of FA. [4+5+6]
2. (a) Write and explain the properties of transition function.
   (b) Prove that for any transition function δ and for any two input strings x and y, $\delta(q, xy) = \delta(\delta(q, x), y)$.
   (c) Define Finite Automata and Transition diagram. [6+5+4]
3. Describe, in the English language, the sets represented by the following regular expressions:
   (a) a(a+b)*ab
   (b) a*b + b*a [15]
4. (a) What is type1 grammar? Give an Example.
   (b) Explain the language generated by type1 grammar.
   (c) Write about the machine corresponding to type1 grammar. [5+5+5]
5. Design Turing Machine for L = { a^n b^n c^n | n ≥ 1 }. [15]
6. (a) Let G be the grammar. S→ aS | aSbS | ε. 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+7]
7. (a) Show that the grammar is ambiguous
   S → a | Sa | bSS | SSb | SbS.
   (b) Find Context Free Grammar for L = {a^i b^j c^k | j=i or j=k}. [7+8]
8. Which of the following are CFL's? explain
   (a) {a^i b^j | i≠j and i≠2j}
   (b) {a^i b^j | i≥1 and j≥1}
   (c) {(a+b)*- {a^n b^n | n≥1}}
   (d) {a^n b^n c^m | n≤m≤2n }. [15]

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Code No: R09220504 **R09** **Set No. 1**

II B.Tech II Semester Examinations,APRIL 2011
FORMAL LANGUAGES AND AUTOMATA THEORY
Computer Science And Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. Describe the following sets by regular expressions
   (a) {101}
   (b) {abba}
   (c) {01,10}
   (d) {a, ab} [15]

2. (a) Draw the transition diagram for a NFA which accepts all strings with either two consecutive 0's or two consecutive 1's.
   (b) differentiate NFA and DFA.
   (c) Construct DFA accepting the set of all strings with atmost one pair of consecutive 0's and atmost one pair of consecutive 1's. [6+4+5]

3. State and explain about closure properties of Context Free Languages. [15]

4. Obtain Chomsky Normal form for following Context Free Grammar
   S→ ∼ S | [S > S] | p | q. [15]

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}, δ, q1, {q3}) is a NFA where δ is given by
   δ (q1, 0) = {q2, q3}, δ (q1, 1) = {q1}
   δ (q2, 0) = {q1, q2}, δ (q2, 1) = $\emptyset$
   δ (q3, 0) = {q2}, δ (q3, 1) = {q1, q2}
   construct an equivalent DFA. [7+8]

6. (a) Design Turing Machine over {0,1}, L = {w | |w| is a multiple of 3}.
   (b) Draw the transition diagram for above language. [11+4]

7. (a) Find the language generated by the grammar. S→0A | 1S | 0 | 1, A→1A | 1S | 1
   (b) Construct context-free grammars to generate the set $\{a^l b^m c^n$ | one of l, m, n equals 1 and the remaining two are equal$\}$. [7+8]

8. Construct LR(0) items for the grammar given find it's equivalent DFA.
   S' → S
   S → AS | a
   A → aA | b [15]

Code No: R09220504 **R09** **Set No. 1**

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Code No: R09220504 **R09** **Set No. 3**

II B.Tech II Semester Examinations,APRIL 2011
FORMAL LANGUAGES AND AUTOMATA THEORY
Computer Science And Engineering

Time: 3 hours **Max Marks: 75**

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.

   [15]

2. (a) What is generating variable? Give example.
   (b) Reduce the following Context Free Grammar
   S→ aAa
   A→ sb / bCC / DaA
   C→abb / DD
   E→aC
   D→aDA

   [4+11]

3. Construct
   (a) A context-free but not regular grammar.
   (b) A regular grammar to generate $\{a^n \mid n>=1\}$. [15]

4. (a) Construct a transition system which can accept strings over the alphabet a, b, ... containing either cat or rat.
   (b) Show that there exist no finite automaton accepting all palindromes over $\{a, b\}$. [7+8]

5. Design Push Down Automata for the language L=$\{wcw^R \mid w\ \varepsilon\ (0+1)^*\}$. [15]

6. Consider the grammar given below
   S → Aa
   A → AB | ε
   B → aB | b
   (a) Find the CLOSURE (S'→ .S)
   (b) GOTO({ A → .AB], [B → . aB] }, A) [7+8]

7. (a) Draw the transition diagram and transition table of FA which accept the set of all strings over the alphabet {0, 1} with equal number of 0's and 1's such that each prefix has atmost one more 0 than 1's and atmost one more 1 than 0's.

   (b) Draw transition diagram and transition table of NFA which accepts the set of all strings over an alphabet {0, 1}, beginning with a '1' which, interpreted as the binary representation of an integer is congruent to 0 modulo 5. And construct an equivalent DFA. [6+9]

8. Design Turing Machine to find 2's complement of a given binary number. [15]

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