Code No: RR310504 **Set No.1**

III B.Tech. I Semester Supplementary Examinations, April/May -2005
THEORY OF COMPUTATION
(Common to Computer Science & Engineering and Computer Science & Systems Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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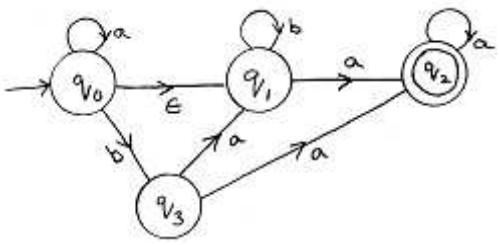
1. (a) With the help of schematic diagram explain the function of DFA. What are the reasons to say it is Deterministic.
   (b) Construct DFA equivalent to the NFA
   M = (p,q,r,s,0,1,S,P,s) and δ is given by

	0	1
p	p,q	p
q	r	r
r	s	-
s	s	s

2. Compare three Finite automata critically.
   b) Construct DFA equivalent to the following Finite automation



3. (a) Construct a DFA for the regular expression 10 + (0+11) 0∗1 and optimize the state
   (b) State and explain closure properties of regular sets.
   (c) Show that the set $\{a^{i^2}/i \geq 1\}$ is not regular. State and explain the theorem used.

4. (a) For the regular expression 0(10)∗ construct right linear and left linear grammar.
   (b) What is meant by ambiguous grammar? Test whether the grammar is ambiguous or not $S \rightarrow a/Sa/bSS/SSb/SbS$.

5. (a) Construct a PDA to accept the language L = w/w S(a, b)*, na(w) = 2nb (w)
   (b) Enumerate the properties of CFL. Explain any two of them.

6. (a) What is delta of a Turing Machine, explain functions involved in a move of Turing Machines in detail.

(b) Design Turing Machine to accept even palindromes derived from the input a, b. Give its Transition table and diagram also.

7. Write short notes on:

   (a) DCFL and DPDA

   (b) LR(k) grammar

   (c) C.S. languages

8. (a) Is concept of universal gates like Nor and Nand and the universal Turing machine same. Explain the UTM in detail.

   (b) What is modified version PCP? Show or explain that if the PCP is decidable then modified PCP is also decidable.

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Code No: RR310504 **Set No.2**

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THEORY OF COMPUTATION
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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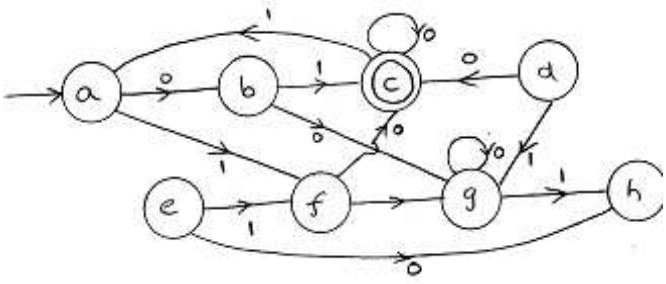
1. (a) Prove or explain with the help of algorithm that "Every NFA will have an equivalent DFA.
   (b) Find DFA equivalent to NFA. described by following state transition table.

   Initial State = P, F = {q,s}

	0	1
→ p	q,s	q
q	r	q,r
r	s	p
s	-	p

2. (a) Describe the procedure to convert the NFA with epsilon transitions to DFA. Illustrate with a simple example.
   (b) Minimize the following Finite automation and prove given and result are equivalent.



3. (a) Construction a DFA for the regular expression r = $(a+b)^*$ a bb and optimize the states.
   (b) Show that L = a^p/*pisprime* is not regular.

4. (a) Construct finite automata recognizing the following regular grammar.
   $A_o \rightarrow$ aA1
   A1 $\rightarrow$ bA1 / bAo /a
   (b) What is meant by ambiguous grammar? Test whether the grammar is ambiguous or not $S \rightarrow A/B, A \rightarrow aAb/abB \rightarrow abB/\wedge$

5. (a) Obtain a PDA to accept strings of balanced parenthesis and verify by a suitable example.

   (b) Convert the following grammar to CNF

   $S \rightarrow bA/aB$
   $A \rightarrow bAA/aS/a$
   $B \rightarrow aBB/bS/b$

6. (a) Compare and contrast Finite automaton, push down Automaton and Turing Machines.

   (b) Design Turing Machine which multiplies two integers. Give its state Transition diagram also.

7. (a)) Discuss different languages and their corresponding machines.

   (b) Write the design procedure of shift reduce parser by taking a suitable example.

8. (a) Differentiate NP complete and NP hard problems. Explain NP complete and NP Hard problems with some examples.

   (b) What is undecidability? Explain PCP and modified PCP in detail.

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Code No: RR310504 **Set No.3**

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THEORY OF COMPUTATION
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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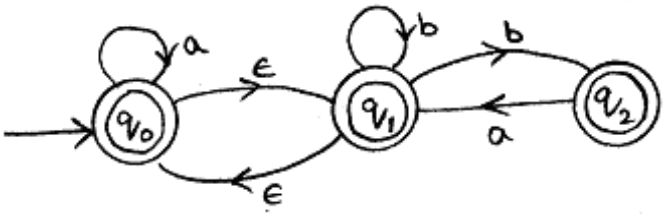
1. (a) Let R=(1,2),(2,2),(2,3) be a relation on the set 1,2,3, Find R*.
   (b) Develop a Deterministic Finite Automation accepting the language given over the alphabet 0,1. L = the set of all strings such that every block of five consecutive contain at least two o's
   (c) Give mathematical definition of NFA and state main differences between NFA and DFA.

2. For the NFA-E given check whether the string aannanan is accepted or not, If accepted write the transition path. Find equivalent NFA without epsilon transitions, explain the procedure used and check the string given on your new NFA.



3. (a) Construct a FA accepting all strings over $\{a, b\}$ ending in aba or aaba.
   (b) Show that $L = \{\omega\omega/\omega\varepsilon\{a, b\}^*\}$ is not regular. State and explain the theorem used.

4. (a) Obtain the regular grammar to accept the strings containing even number of zeroes.
   (b) Give the CFG to generating the following sets. The set of palindromes over alphabet$\{a, b\}$

5. (a) Construct PDA to accept the CFG and verify by a suitable example.
   $S \rightarrow aABC$
   $A \rightarrow aB/C$
   $B \rightarrow bA/b$
   $C \rightarrow a$
   (b) Convert the following grammar to GNF
   $S \rightarrow AA/a$
   $A \rightarrow SS/b$

6. (a) Briefly explain the properties of recussive enumerable languages.
   (b) Design Turing Machine to recognize the palindromes of digits $\{0, 1\}$. Give its state transition Diagram also.
7. (a) 'Every context free language is not a context sensitive.' Why? Discuss with the help of productions.
   (b) What do you mean by prefix property of DCFL.
   (c) Discuss the concept of viable prefix with a suitable example.
8. Write short notes on
   (a) Undecidability
   (b) PCP
   (c) Turing reducability.

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Code No: RR310504 **Set No.4**

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

Answer any FIVE Questions
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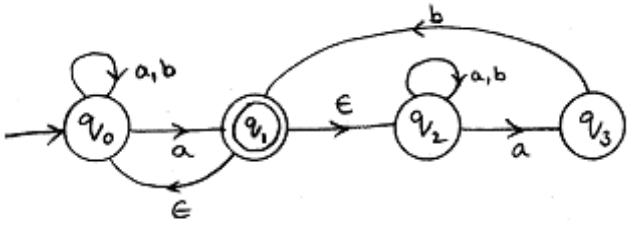
1. (a) Define a NDFA and explain how an equivalent DFA is obtained from NDFA..
   (b) Construct an equivalent DFA for a NDFA M=(q1,q2,q3,, ?, q1, q3) where ? is given by
   $\delta(q_1, 0) = \{q_2 q_3\}$, $\delta(q_1,1) = \{q_1\}$
   $\delta(q_2, 0) = \{q_1 q_2\}$, $\delta(q_2,1) = \phi$
   $\delta(q_3, 0) = \{q_2\}$, $\delta(q_3,1) = \{q_1 q_2\}$

2. For the NFA-E given check whether the string aannanan is accepted or not, If accepted write the transition path. Find equivalent NFA without epsilon transitions, explain the procedure used and check the string given on your new NFA.



3. (a) Construct a regular expression representing the following sets The set of all strings over {a,b} in which there are atleast two occurrences of b between any two occurrences of a.
   (b) Describe whether L = $\{a^{2n} | n \geq 1\}$is regular. State and explain the theorem used.

4. (a) Construct a regular grammar G generating the regular set represented by a*b(a+b)*.
   (b) Give the CFG to generating the following sets. The set of all strings of balanced parenthesis

5. (a) Convert the following GNF
   $S \rightarrow aA/B/C/a$
   $A \rightarrow aB/\varepsilon$
   $B \rightarrow aA$
   $C \rightarrow cCD$
   $D \rightarrow abd$

(b) Construct CFG generating the set of all strings over {a, b} consisting of equal no of a's and b's.

6. (a) Give tuple definition of Turing Machine and explain the significance of movement of R/W head.

   (b) Design Turing Machine to recognize the language $L = \{a^n b^n / n \geq 1\}$

7. Construct LR(0) items for the grammar given, find its equivalent DFA. Check the parsing by taking a suitable derived string.

   $S \rightarrow a\ A\ B$

   $A \rightarrow a\ A\ b \mid a\ b$

   $\mathbf{B} \rightarrow a\,B \mid a$

8. Discuss any three of the following briefly.

   (a) Decidability of problems

   (b) Undecidability of post correspondence problem.

   (c) P and NP problems.

   (d) RICEs theorem.

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