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M S RAMAIAH INSTITUTE OF TECHNOLOGY

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)

BANGALORE – 560 054

MAKE UP EXAMINATIONS - JULY 2010

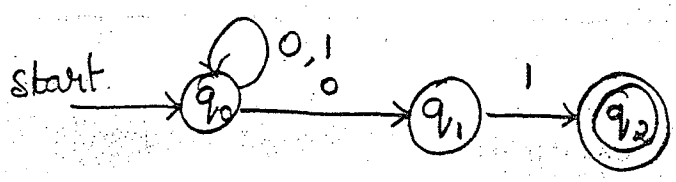
Course & Branch	:	**B.E.(Information Science & Engineering)**	Semester	:	**IV**
Subject	:	**Finite Automata and Formal Languages**	Max. Marks	:	**100**
Subject Code	:	**IS42**	Duration	:	**3 hrs.**

Instructions to the Candidates: Answer one full question from each unit

UNIT-I

1. a) Define DA, NFA & ε-NFA. Construct a DFA that recognizes the set of all strings on Σ={a,b} ending with abb. (10)

   b) Convert the following NFA to DFA using subset construction method. Write transition table of DFA. (10)



2. a) Obtain a DFA to accept the following language. (8)
   L={w, such that |w|mod3 ≥ |w|mod2
   Where wε{a,b}*}

   b) Obtain regular expressions for the following languages. (4)
   i) L = {$a^n b^m$|m+n is even}
   ii) L = {w : n_a(w)mod3=0 where wε{a,b}*}

   c) Prove that, if L=L(A) for some DFA A, then there is a regular expression R such that L=L(R). (8)

UNIT – II

3. a) Prove that if L & M are the regular languages, then L∩M is also regular. (8)

   b) Using table filling method, minimize the following DFA. Write the transition table of resulting DFA. (12)

		0	1
→	A	B	E
	B	C	F
*	C	D	H
	D	E	H
	E	F	I
*	F	G	B
	G	H	B
	H	I	C
*	I	A	E

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4. a) State and prove pumping Lemma for regular languages. (10)
   b) S.T. $L=\{a^nb^n|n\geq 0\}$ is not regular. (6)
   c) Define homomorphism and inverse homomorphism. (4)

UNIT –III

5. a) Write the CFG for the following languages. (8)
      i) $L=\{w|n_a(w)=n_b(w)+1\}$
      ii) $L=\{a^nb^m \mid n\geq 0, m>n\}$
   b) Consider the grammar - (8)
      $S \rightarrow aB/bA$
      $A \rightarrow aS/bAA/a$
      $B \rightarrow bS/aBB/b$
      Find 2 leftmost derivation in the string aabbab and write parse trees.
   c) Define CFG and CNF. Give an example in each. (4)

6. a) Consider the grammar - (12)
      $E \rightarrow T|E+T$
      $T \rightarrow T*F/F$
      $F \rightarrow (E)|I$
      $I \rightarrow Ia|Ib|I\phi|I1|a|b$
      i) Remove unit-productions from the grammar
      ii) Write the CNF of the resulting grammar
   b) Eliminate ε-productions from the given grammar (4)
      $S \rightarrow ABC/BaB$
      $A \rightarrow aA/BaC/aaa$
      $B \rightarrow bBb|a|D$
      $C \rightarrow CA|AC$
      $D \rightarrow \varepsilon$
   c) S.T. $L = \{a^nb^nc^n|n\geq 0\}$ is not content free (4)

UNIT – IV

7. a) Derive PDA and construct a PDA that accepts the language (12)
      $L=\{WCW^R : W\varepsilon\{a,b\}^*, W^R$ is reverse of W} by a final state. Write the ID in string aabCbaa.
   b) Convert the PDA $P_N = (\{q\}, \{i,e\},\{z\}, S_N,q,z\}$ to a CFG, if S_N is given by (8)
      i) $S_N(q,i,z) = (q,zz)$
      ii) $S_N(q,e,z)=(q,\varepsilon)$

8. a) With a neat diagram, explain the working of a pushdown automata. (6)
   b) Is the PDA to accept the language $L(M)=\{W|W\varepsilon\{a+b\}^*$ ad $n_a(w)=n_b(w)\}$ deterministic? (10)
   c) For the following grammar construct a PDA. (4)
      $S \rightarrow aABB|aAA$
      $A \rightarrow aBB|a$
      $B \rightarrow bBB|A$
      $C \rightarrow a$

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UNIT - V

9. a) What are Turing Machine and Multitape Turing Machine? Explain the general structure multi tape Turing Machine. (8)

   b) Design a Turing Machine to accept the language $L=\{0^n1^n, n\geq1\}$. Also give the graphical representation and ID for the input 0011. (12)

10 a) Obtain a TM to compute the – which is called monus or proper subtraction and is defined by m-n=max (m-n,o). Write the transition diagram. (14)

   b) Discuss about Halting problem of TM. (6)

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