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M.S. RAMAIAH INSTITUTE OF TECHNOLOGY
(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)
BANGALORE – 560 054

SUPPLEMENTARY SEMESTER EXAMINATIONS - 2010

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

Instructions to the Candidates:
1. Answer One Full Question From Each Unit.

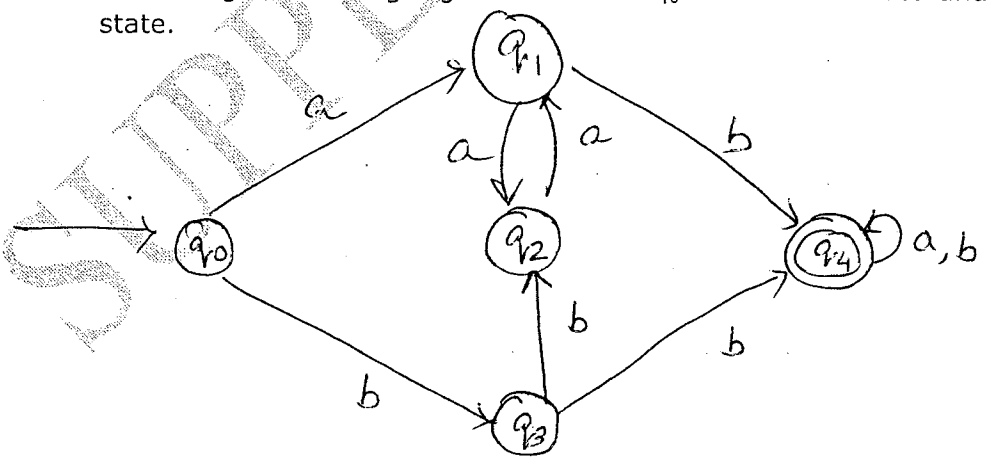
UNIT-I

1. a) Define the term alphabet, string and language with an example for each. (06)
   b) Define DFA. Obtain a DFA which will recognize all strings except those containing the substring aab. Over the $\sum=\{a,b\}$. (09)
   c) Bring out the differences between DFA & NFA. (05)

2. a) Define regular expression. Prove that for all languages define by a regular expression there exits an equivalent, NFA which accepts exactly the same language. (12)
   b) Define an NFA and describe the subset construction procedure. (08)

UNIT-II

3. a) Write short notes on decision properties of regular languages. (07)
   b) What are distinguishable and indistinguishable states? Minimize the following DFA using table filling algorithm where q_0 is the start state and q_4 is final state. (13)



4. a) State and prove pumping lemma for regular languages. Show that the language $L=\{Ww^R \mid w\in\{a,b\}^*\}$ is not regular. (12)
   b) Show that the regular languages are closed under complementation. (05)
   c) Define homomorphism on strings with an example. (03)

UNIT-III

5. a) Define a CFG. Give a CFG for the language (08)
$L = \{w \mid w \in (0,1)^*, n_0(w) \neq n_1(w)\}$

b) Write a note on (12)
i) Ambiguous grammar
ii) Inherently ambiguous grammars
iii) Parse trees.

6. a) Define Chomsky Normal Form. (08)
Convert the following CFG to CNF
$S \rightarrow OA \mid 1B$
$A \rightarrow OAA \mid 1S \mid 1$
$B \rightarrow \mid BB \mid OS \mid O$

b) State and prove the pumping lemma for CFL's (10)

c) List out the applications of CFG. (02)

UNIT-IV

7. a) Prove that the family of CFL's is not closed under intersection and complementation. (12)

b) With a neat diagram explain the working of PDA. (08)

8. a) Define the acceptance of PDA by "final state" and acceptance by "empty state" (05)

b) Design a PDA for the language $L = \{a^n b^n \mid n \geq 1\}$. Give the trace for the input aaabbb. (10)

c) Distinguish between DPDA & NPDA. (05)

UNIT-V

9. a) Explain briefly the basic model of a turing machine along with relevant terms. (10)

b) Obtain a turing machine to accept the language $L = \{0^n 1^n 2^n \mid n \geq 1\}$. Give the trace for 001122. (10)

10 a) Prove that the every language accepted by a turing machine is recursively enumerable (10)

b) Write a short notes on (10)
i) Halting problem of turing machine.
ii) Non deterministic turing machine.

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