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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Fourth Semester, B.E. - Computer Science and Engineering

Semester End Examination; June/July - 2015

Theory of Computation

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each **Unit**.*
ii) Assume suitable missing data if any.

UNIT - I

1. a. Define the terms :

i) Power of on alphabet ii) Language

iii) Extended transition functions iv) $\in$-closure 10

b. Design DFA to accept set of all strings on the alphabet $\Sigma = \{0,1\}$ that either begin or ends or both with substring "01" and also compute $\hat{\delta} = (q_0, 0110)$. 10

2 a. Write subset construction algorithm and convert the following $\in$-NFA to DFA

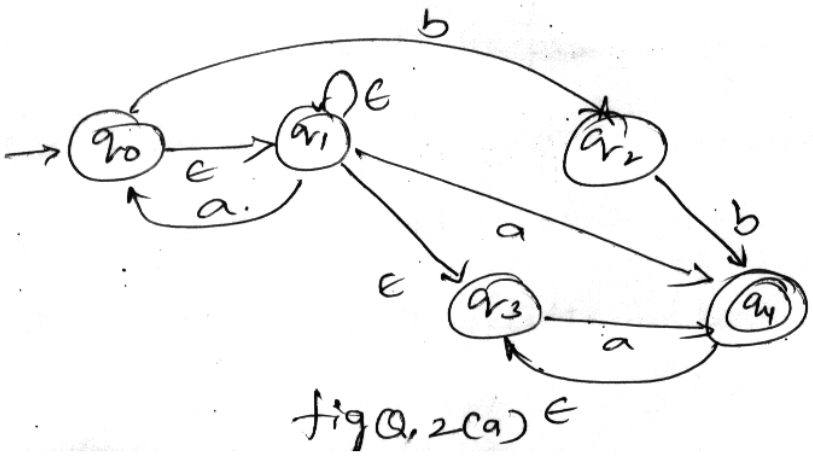


fig Q. 2(a) 10

b. What is distinguishable state and minimize the following DFA using table filling algorithm.

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

10

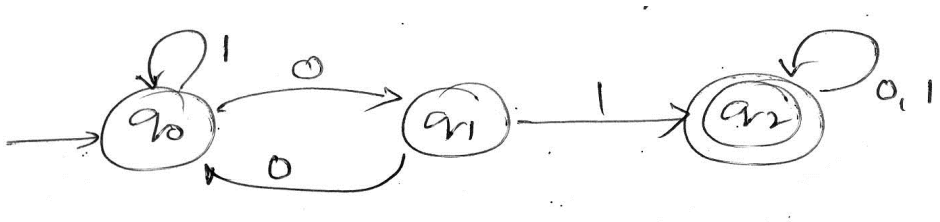
Contd…2

UNIT - II

3 a. Define a Regular expression obtain a regular expression to accept the language L of all strings in $\{a,b\}^*$ that contain at least one of the two substring ab and bba. 6

b. Prove that if $L = L(A)$ for some DFA A, then there is a regular expression such that $L = L(R)$. 7

c. Obtain a regular expression for a finite Automata show below using state elimination.



7

4 a. State and prove the pumping lemma for regular languages. 7

b. Construct the DFA for the following languages.

L_1 = { set of 0's and 1's and with at least one 1}

L_2 = { set of 0's and 1's with at least one 0}

and draw DFA for the following : 8

i) $L_1 \cup L_2$ ii) $L_1 \cap L_2$ iii) $L_1 - L_2$

c. Mention the application of Regular expression and describe any one in detail. 5

UNIT - III

5 a. Define context free grammar and contract the CFG for the following grammar

$L = \{0^i 1^j 2^k \mid i = j \text{ or } j = k\}$. 8

b. What is meant by ambiguous grammar? Is the following grammar is ambiguous

$S \rightarrow aS \mid aSbS \mid \in$. 6

c. Consider the grammar $E \rightarrow +EE \mid *EE \mid -EE \mid x \mid y$. Find the leftmost and rightmost derivation for the string +*-*xyxy* and write parse tree. 6

6. a. Define CNF, and convert the following CFG to CNF

$S \rightarrow aA / aB$

$A \rightarrow aaA / B / \in$ 10

$B \rightarrow b / bB$

$D \rightarrow B$

b. Mention the application of CFG and describe any two of them in detail. 10

Contd…3

UNIT - IV

7 a. Define the following terms:

i) Pushdown Automata ii) Language of PDA

iii) Instantaneous description iv) Deterministic Pushdown Automata

10

b. Design the PDA for the following Language $L=\{w|w\in\{a,b\}^* n_a(w)>n_b(w)\}$ and show the instantaneous description of the PDA on the input string aaabb. 10

8 a. Design deterministic Pushdown automata for the following language and draw the transition diagram. 10

$L=\{a^n c^m b^n \mid n, m\geq 1\}$

b. Write the procedure used to connect the given PDA to CFG, also obtain a CFG for the PDA $M=(\{q_0,q_1\},\{a,b\},\{A,Z_0\},\delta,q_0,z_o,q_1\}$ with transitions 10

$\delta(q_0,a,Z_0)=(q_0,AZ_0)$

$\delta(q_0,b,A)=(q_0,AA)$

$\delta(q_0,a,A)=(q_1,\in)$

UNIT - V

9 a. Explain the general structure of multi tape and non deterministic turing machine and show that are equivalent to basic turning machine. 10

b. Design the turing machine to accept all set of even length palindromes over $\{a,b\}^*$ also write its transitions diagram and give ID for the input “abba”. 10

10 a. Write short notes on :

i) Post correspondence problem

ii) Recursive language

iii) Universal language

10

b. Prove that if a language L and its complement are recursively enumerable, then L is recursive. 10

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