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

(An Autonomous Institution affiliated to VTU, Belagavi)

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

Semester End Examination; June - 2017

Finite Automata and Formal Languages

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions selecting **ONE** full question from each unit.*

UNIT - I

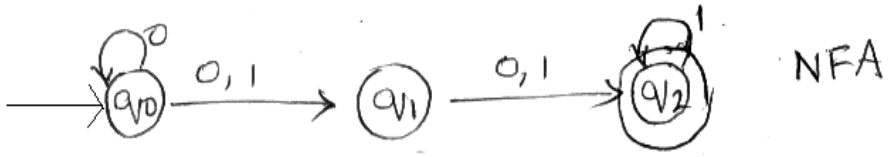
1. a Construct a DFA to accept the following

i) Strings of 0's and 1's starting with at least two 0's ending with at least two1's 8

ii) Strings of a's and b's having even number a's and odd number of b's

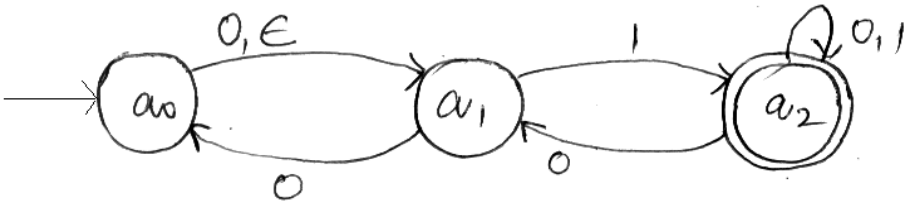
b. Differentiate between NFA and DFA and explain the applications of Finite automata. 5

c. Convert the given NFA to DFA



7

2 a. Construct a DFA from the following epsilon NFA.



6

b. Design a DFA to accept the language

$L = \{W(ab+ba) \mid W \in \{a,b\}\}$ 4

c. Find the minimized DFA for the following:

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

10

Contd…2

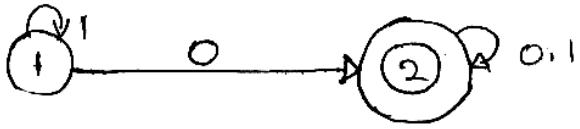
UNIT - II

3 a. Obtain the regular expression for the following languages

i) L=$\{a^n b^m : (m+n)$ is even$\}$

ii) L=$\{a^n b^m : n > 4$ and $m \leq 3\}$ 4

b. Obtain the regular expression from the given DFA using Kleen's theorem



6

c. Construct the automata for the regular expression (a+b) (ab+ba)*aa 4

d. List and explain the applications of regular expressions. 6

4 a. Obtain the regular expression for the following DFA using state elimination method.

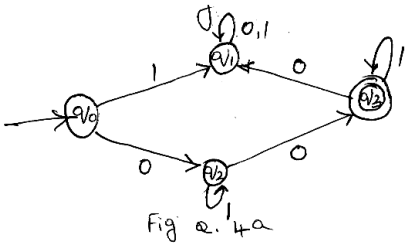


Fig Q. 4a

3

b. State and prove pumping lemma for regular languages. 10

c. Prove that the language

L={ $a^{n!}$/ n≥0 }

Is not regular? 7

UNIT - III

5 a. Write the CFG for the following languages

i) L= {$a^i b^j c^k$: i+j = k, *l*, j >= 0}

ii) L= {$a^n b^m c^k$: n+2m = k, n, m, k >= 0} 5

b. Obtain two leftmost & rightmost derivations for the string 'abababa' from the grammar

S→SbS|a 5

c. Write CFG for the language consist of strings of palindrome with the input symbols a and b. Where the length of the string may be even or odd. 5

d. Show that the following grammar is ambiguous:

$S \rightarrow S + S \mid S * S \mid S - S \mid a \mid b \mid c$ 5

6. a Remove all useless productions, unit productions and ∈ productions from the grammar

$S \rightarrow ABC \mid BaB \quad A \rightarrow aA \mid BaC \mid aaa \quad B \rightarrow aBa \mid a \mid D$

$C \rightarrow CA \mid AC \quad D \rightarrow \in$ 10

Contd…3

b. If L_1 and L_2 are CFL then P.T. they are closed under union and concatenation operations. 6

c. Convert the following CFG to CNF $S \rightarrow ABa$ A $\rightarrow$ aab B $\rightarrow$ AC 4

UNIT - IV

7 a. Design a PDA to accept a string of balanced parenthesis and also show the string acceptation for the string W=[( )]. 12

b. Construct a PDA from the grammar : 8

$S \rightarrow aABB / aAA$

$A \rightarrow aBB / a$

$B \rightarrow bBB / A$

$C \rightarrow a$

S is a Start symbol

8 a. Construct a PDA for the language 12

$L = \{WW^R \mid w \in (a+b)^*\}$ and show the string acceptance for the string abbbba.

b. Convert the following grammar into PDA 8

S→aSa/aa

S→bSb/bb

And also show the string acceptance.

UNIT-V

9 a. Design Turing machine to accept the language having string of palindromes over {a, b}. 10

b. Design a Turing machine to accept the language consists of equal number of 0's and 1's 10

10 a. Explain ID, acceptance of language with respect to Turing machine with an example. 8

b. Explain the following: 12

i) Post correspondence problem

ii) Undecidable problems

iii) Multi track Turing machine.

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