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

(An Autonomous Institution affiliated to VTU, Belgaum)
Fourth Semester, B.E., - Information Science and Engineering
Semester End Examination; June - 2016
Finite Automata and formal Languages

Time: 3 hrs   *Max. Marks: 100*

Note: i) Answer **FIVE** full questions, selecting **ONE** full question from each **unit**.
   ii) *Missing data may be assumed suitably.*

UNIT - I

1 a. Construct DFA which accepts strings of of a's and b's such that,

$L = \{awa \mid w \in (a+b)^n \text{ where } n \geq 0\}$.   8

b. Differentiate between NFA, DFA and ϵ-NFA.   10
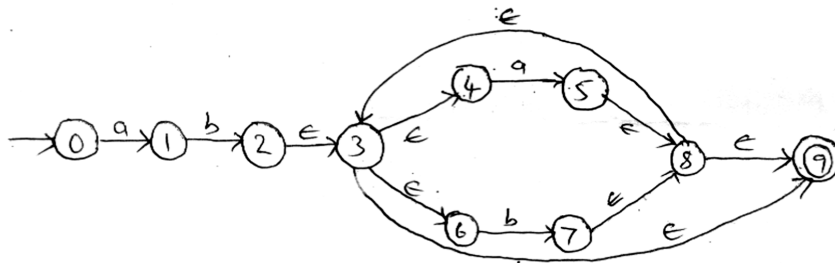
c. Define transition diagram.   2

2 a. List any five applications of finite automata.   5

b. Convert the following NFA to its equivalent DFA.

10

c. Construct the DFA to accept strings of a's and b's having four a's.   5

UNIT - II

3 a. List and explain any five applications of regular expression. Also give examples for each.   10

b. Show that if L and M are regular languages, then $L \cap M$ is also regular.   5

c. Show that if the language L is regular, then L^R is also regular.   5

4 a. Write the regular expressions for the following :

   i) $L(R) = \{w \mid w \in \{0,1\}^* \text{ with at least three one occurrence of consecutive 0's.}$

   ii) $L = \{a^n b^m \mid m+n \text{ is even}$

   iii) $L = \{w : n_a(w) \bmod 3 = 0 \text{ where } w \in (a,b)^*\}$

   iv) $L = \{vuv : v \in \{a,b\}^* \text{ and } |v| = 2\}$

10

b. List and explain the properties of regular languages.   10

UNIT - III

5 a. What is the language generated by the grammar,

$S \rightarrow 0A | \in$

$A \rightarrow 1S$

  5

  b. Obtain grammar to generate the language,

$L = \{a^{n+2}b^n | n \geq 0 \text{ and } m > n\}$

  5

  c. Show that $L = \{a^n b^n c^n | n \geq 1\}$ is not a context free.

  10

6. a. Prove that the following grammar is ambiguous :

  i) $S \rightarrow a | aAb | abSb$

    $A \rightarrow aAAb | bS$

  ii) $S \rightarrow iCtS | iCtSeS | a$

    $C \rightarrow b$

  8

  b. Describe the Chomsky Hierarchy of the grammars.

  12

UNIT - IV

7 a. Prove that a language is accepted by a PDA by the empty stack if and only if the language is accepted by a PDA by the final state.

  10

  b. Construct a PDA to accept a given language L by both the empty stack the final state where

$L = \{a^n b^n, \text{ where } n \geq 1\}$

  10

8 a. Construct a PDA to accept the language

$L = \{W \subset W^R, \text{ where } W \in (a,b)+ \text{ and } w^R \text{ is the reverse of } w\}$ by the empty stack and by the final state.

  12

  b. Explain the push down Automata with the help of a neat diagram.

  8

UNIT - V

9 a. Define and explain Turing machine.

  6

  b. Obtain the Turing machine to accept a palindrome consisting of a's and b's of any length.

  14

10 a. Briefly explain the undecidable problems that are regular expressions.

  8

  b. Explain the post's correspondence problem and universal languages.

  12

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