



NARSIMHA REDDY ENGINEERING COLLEGE

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FORMAL LANGUAGES AND AUTOMATA THEORY (23CY503)

UNIT II – Regular Languages and Regular Expressions

Part-A: Short Answer Questions

1. Define Regular Expression.
2. What is a Regular Language?
3. State the Pumping Lemma for Regular Languages.
4. Define Closure Property.
5. What is Language Equivalence?
6. Define Automata Minimization.
7. What is Concatenation in Regular Expressions?
8. Define Kleene Closure.
9. What is Union Operation?
10. What is a Minimal DFA.

Part-B: Descriptive Questions

1. Explain the relationship between finite automata and regular expressions.
2. Discuss applications of regular expressions in computing.
3. Explain algebraic laws of regular expressions with examples.
4. Convert a finite automaton into an equivalent regular expression.
5. Explain the Pumping Lemma and its applications.
6. Discuss closure and decision properties of regular languages.

Tutorial Assignment:

Construct a regular expression for binary strings containing an even number of 1's.

Part-C MCQs

1. Regular Expressions are used to describe:

- A) Regular Languages
- B) Context-Free Languages
- C) Recursive Languages
- D) None

2. The Kleene Star (*) represents:

- A) Zero or more occurrences
- B) One occurrence
- C) Two occurrences
- D) Infinite states

3. The Union operator is represented by:

- A) +
- B) *
- C) .
- D) #

4. The concatenation of 'a' and 'b' is:

- A) ab
- B) a+b
- C) a*b
- D) ba

5.Arden's Theorem is used for:

- A) Converting FA to RE
- B) PDA Design
- C) Turing Machine Design
- D) Minimization

6.Pumping Lemma is used to:

- A) Prove languages are not regular
- B) Design DFA
- C) Design PDA
- D) Design TM

7.Regular Languages are closed under:

- A) Union
- B) Intersection
- C) Complement
- D) All of the Above

8.A minimized DFA contains:

- A) Minimum states
- B) Maximum states
- C) Infinite states
- D) No final states

9.Equivalent automata accept:

- A) Same language
- B) Different language
- C) Empty language
- D) Infinite language

10.The language \emptyset represents:

- A) Empty Language
- B) Empty String
- C) Alphabet
- D) State

11. ϵ represents:

- A) Empty String
- B) Empty Language
- C) State
- D) Input

12.The closure operation is:

- A) Kleene Star
- B) Union
- C) Intersection
- D) Complement

13.Regular expressions are widely used in:

- A) Pattern Matching
- B) Networking
- C) Databases

- D) OS
14. DFA minimization removes:
- A) Equivalent States
 - B) Final States
 - C) Initial State
 - D) Inputs
15. Pumping length is represented by:
- A) p
 - B) n
 - C) q
 - D) r
16. Regular languages are closed under:
- A) Reversal
 - B) Union
 - C) Complement
 - D) All
17. Arden's theorem solves:
- A) Regular Expression Equations
 - B) PDA Problems
 - C) CFG Problems
 - D) TM Problems
18. The expression a^* includes:
- A) ϵ
 - B) a
 - C) aa
 - D) All
19. The regular expression for all strings over $\{a,b\}$ is:
- A) $(a+b)^*$
 - B) ab
 - C) a^*b
 - D) ba^*
20. Regular Languages are accepted by:
- A) Finite Automata
 - B) PDA
 - C) TM
 - D) CFG

Part-D Fill in the Blanks

1. Regular Expressions describe _____ languages.
Answer: Regular
2. Kleene Star represents _____ or more occurrences.
Answer: Zero
3. The symbol ϵ represents the _____ string.
Answer: Empty
4. Union operation is represented by _____.
Answer: +
5. Concatenation joins two _____.
Answer: Strings

6. Arden's theorem is used to obtain _____ expressions.
Answer: Regular
7. Pumping Lemma helps prove languages are _____ regular.
Answer: Not
8. The pumping length is denoted by _____.
Answer: p
9. DFA minimization removes _____ states.
Answer: Equivalent
10. Regular Languages are closed under _____.
Answer: Union
11. Regular Languages are closed under _____.
Answer: Complement
12. Regular Languages are closed under _____.
Answer: Intersection
13. Finite Automata accept _____ languages.
Answer: Regular
14. Equivalent automata recognize the same _____.
Answer: Language
15. The expression a^* contains the _____ string.
Answer: Empty
16. Pattern matching commonly uses _____ expressions.
Answer: Regular
17. Closure under reversal means the reverse language is also _____.
Answer: Regular
18. A minimized DFA has _____ states.
Answer: Minimum
19. Pumping Lemma consists of _____ conditions.
Answer: Three
20. Regular Expressions and Finite Automata are _____.
Answer: Equivalent