

# United College of Engineering & Research, Prayagraj

## Department of Computer Science & Engineering

### Assignment Paper, 2020-2021

**Assignment No.:** 4

**Semester:** IV

**Course Name:** Automata Theory

**Max. Marks:** 20

**AKTU Course Code:** KCS-402

**Note:** All questions are **compulsory**.

1. How many strings of length less than 4 contains the language described by the regular expression  $(x+y)^*y(a+ab)^*$ ?
  - a) 7
  - b) 10
  - c) 12
  - d) 11
2. Which of the following is true?
  - a)  $(01)^*0 = 0(10)^*$
  - b)  $(0+1)^*0(0+1)^*1(0+1) = (0+1)^*01(0+1)^*$
  - c)  $(0+1)^*01(0+1)^*+1^*0^* = (0+1)^*$
  - d) All of the mentioned
3. What kind of expressions do we used for pattern matching?
  - a) Regular Expression
  - b) Relational Expression
  - c) Regular & Rational Expression
  - d) None of the mentioned
4. Which of the technique can be used to prove that a language is non regular?
  - a) Ardens theorem
  - b) Pumping Lemma
  - c) Ogden's Lemma
  - d) None of the mentioned
5. Which of the following language regular?
  - a)  $\{a^ib^j|i \geq 0\}$
  - b)  $\{a^ib^j|0 < i < 5\}$
  - c)  $\{a^ib^j|i \geq 1\}$
  - d) None of the mentioned
6. If L is DFA-regular, L' is
  - a) Non regular
  - b) DFA-regular

- c) Non-finite
  - d) None of the mentioned
7. Myhill Nerode does the following:
- a) Minimization of DFA
  - b) Tells us exactly when a language is regular
  - c) Both (a) and (b)
  - d) None of the mentioned
8. . Finite state machine are not able to recognize Palindromes because:
- a) Finite automata cannot deterministically find the midpoint
  - b) Finite automata cannot remember arbitrarily large amount of data
  - c) Even if the mid point is known, it cannot find whether the second half matches the first
  - d) All of the mentioned
9. Relate the following statement:  
Statement: All sufficiently long words in a regular language can have a middle section of words repeated a number of times to produce a new word which also lies within the same language.
- a) Turing Machine
  - b) Pumping Lemma
  - c) Arden's theorem
  - d) None of the mentioned
10. While applying Pumping lemma over a language, we consider a string  $w$  that belong to  $L$  and fragment it into \_\_\_\_\_ parts.
- a) 2
  - b) 5
  - c) 3
  - d) 6
11. If we select a string  $w$  such that  $w \in L$ , and  $w = xyz$ . Which of the following portions cannot be an empty string?
- a)  $x$
  - b)  $y$
  - c)  $z$
  - d) all of the mentioned
12. Let  $w = xyz$  and  $y$  refers to the middle portion and  $|y| > 0$ . What do we call the process of repeating  $y$  0 or more times before checking that they still belong to the language  $L$  or not?
- a) Generating
  - b) Pumping
  - c) Producing
  - d) None of the mentioned

13. Which kind of proof is used to prove the regularity of a language?
- a) Proof by contradiction
  - b) Direct proof
  - c) Proof by induction
  - d) None of the mentioned
14. State true or false:  
Statement: Pumping lemma gives a necessary but not sufficient condition for a language to be regular.
- a) true
  - b) false
15. If  $L_1$ ,  $L_2$  are regular and  $op(L_1, L_2)$  is also regular, then  $L_1$  and  $L_2$  are said to be \_\_\_\_\_ under an operation  $op$ .
- a) open
  - b) closed
  - c) decidable
  - d) none of the mentioned
16. If  $L_1'$  and  $L_2'$  are regular languages, then  $L_1.L_2$  will be
- a) regular
  - b) non regular
  - c) may be regular
  - d) none of the mentioned
17. If  $L_1$  and  $L_2'$  are regular languages,  $L_1 \cap (L_2' \cup L_1)'$  will be
- a) regular
  - b) non regular
  - c) may be regular
  - d) none of the mentioned
18. Which of the following conversion is not feasible?
- a) Regular expression to automaton conversion
  - b) Automaton to Regular Expression Conversion
  - c) NFA to DFA
  - d) None of the mentioned
19. Language classes have the following property:
- a) Closure property
  - b) Decision property
  - c) Closure & Decision property
  - d) None of the mentioned
20. Which of the following are decision properties?
- a) Emptiness
  - b) Infiniteness

- c) Membership
  - d) All of the mentioned
21. Which among the following are incorrect regular identities?
- a)  $\epsilon R = R$
  - b)  $\epsilon^* = \epsilon$
  - c)  $\Phi^* = \epsilon$
  - d)  $R\Phi = R$
22. Simplify the following regular expression:  
 $\epsilon + 1^*(011)^*(1^*(011)^*)^*$
- a)  $(1+011)^*$
  - b)  $(1^*(011)^*)^*$
  - c)  $(1+(011)^*)^*$
  - d)  $(1011)^*$
23. P, Q, R be regular expression over  $\Sigma$ , P is not  $\epsilon$ , then  
 $R = Q + RP$  has a unique solution:
- a)  $Q^*P$
  - b)  $QP^*$
  - c)  $Q^*P^*$
  - d)  $(P^*Q)^*$
24. Arden's theorem is true for:
- a) More than one initial states
  - b) Null transitions
  - c) Non-null transitions
  - d) None of the mentioned
25. The difference between number of states with regular expression  $(a + b)$  and  $(a + b)^*$  is:
- a) 1
  - b) 2
  - c) 3
  - d) 0
26.  $(0+\epsilon)(1+\epsilon)$  represents
- a)  $\{0, 1, 01, \epsilon\}$
  - b)  $\{0, 1, \epsilon\}$
  - c)  $\{0, 1, 01, 11, 00, 10, \epsilon\}$
  - d)  $\{0, 1\}$
27. Regular Expression denote precisely the \_\_\_\_\_ of Regular Language.
- a) Class
  - b) Power Set
  - c) Super Set
  - d) None of the mentioned

28. Consider the regular language  $L = (11 + 111)^*$ . The minimum number of states in any DFA accepting this languages is:

- a) 2
- b) 3
- c) 4
- d) 5

29. Consider the following two statements:

S1:  $\{0^{2n} \mid n \geq 1\}$  is a regular language

S2:  $\{0^m 1^n 0^{m+n} \mid m \geq 1 \text{ and } n \geq 1\}$  is a regular language

- a. Only S1 is correct
- b. Only S1 is correct
- c. Both S1 and S2 are correct
- d. None is correct.

30. Let S and T be language over  $\Sigma = \{a,b\}$  represented by the regular expressions  $(a+b^*)^*$  and  $(a+b)^*$ , respectively. Which of the following is true?

- a.  $S \subseteq T$
- b.  $T \subseteq S$
- c.  $S = T$
- d.  $S \cap T = \emptyset$