	Ministry of Higher Education **Higher Technological Institute** **10th Ramadan City**	
	Department : Computer Science	**Code : CSC 421**
	Course Name : Computability Theory	**Term: Jan.- May 2022/2023**
	Eng. Aya Ashraf, Eng. Eman Abdel Hady	**All Groups**

Choose the correct answer

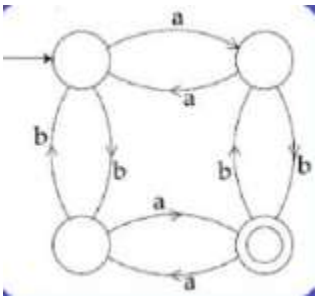
1. Which one of these given regular expressions isn't equivalent to this regular expression (m + n + o) *

a. (m*n* + o*)* b. ((mn)* + o*)* c. (m*n*o*)* d. (m* + n* + o*)*

2. A DFA can be expressed as a 5 tuple (Q, ∑, δ, q_0, F), where δ is the transition function is defined as

a. $\delta: \sum \rightarrow Q$ b. $\delta: Q * Q \rightarrow \sum$ c. $\delta: Q \rightarrow Q$ d. $\delta: Q * \sum \rightarrow Q$

3. The finite state machine given below recognizes:



a. any string of odd number of a's and even number of b's.

b. any string of even number of a's and odd number of b's.

c. any string of odd number of a's and odd number of b's.

d. any string of odd number of a's.

4. Given the language L = {ab, aa, baa}, which of the following strings are in L*?

a. abaabaaabaa b. aaaabaaaa c. baaaaabaaaab d. baaaaabaa

5. The non-kleen star operation accepts the following string of finite length over set A={0,1} where string s contains even number of 0 and 1

a. 01, 0011, 010101 b. 0011, 11001100 c. ε, 0011, 11001100

6. Which of the following is a not part of 5-tuple finite automata?

a. input alphabet b. transition function c. initial state d. output alphabet

7. The number of elements in the set for language L={x∈ $(\sum r)^*$| length if x is at most 2} and $\sum = \{0, 1\}$ is

a. 7 b. 6 c. 8 d.5

8. For the following change of state in FA, which of the following codes is an incorrect option?

a. $\delta(m, 1) = n$ b. $\delta(0, n) = m$ c. $\delta(m, 0) = \varepsilon$

9. Given: ∑= {a, b}, L= {xϵ∑*|x is a string combination} $\sum^4$ represents which among the following?

a. {aa, ab, ba, bb} b. {aaaa, abab, ε, abaa, aabb} c. {aaa, aab, aba, bbb} d. All of the mentioned

10. A DFA cannot be represented in the following format

a) Transition graph b) Transition Table c) C code d) None of the mentioned

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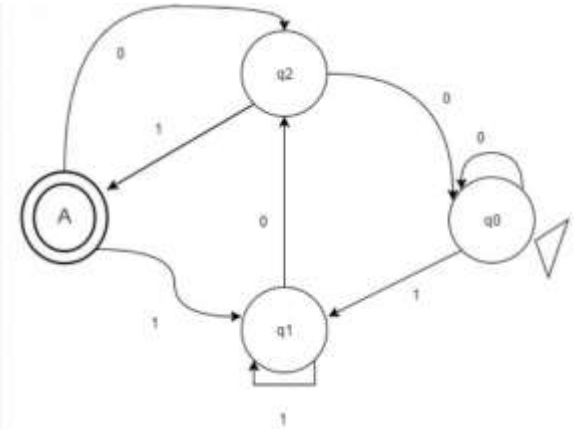
11. When are 2 finite states equivalent?

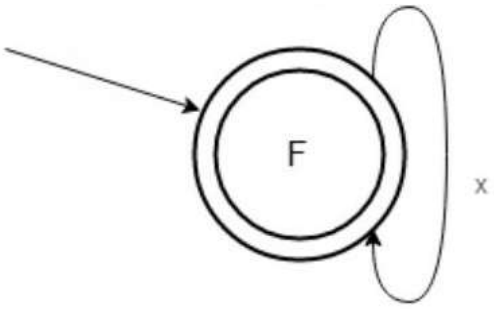
a) Same number of transitions
b) Same number of states
c) Same number of states as well as transitions
d) Both are final states

12. What the following DFA accept?



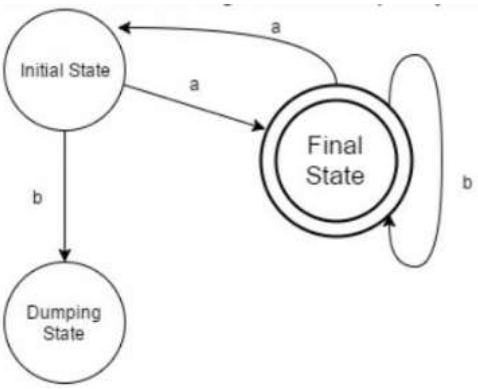
a. X is a string such that it ends with 101.
b. X is a string such that it ends with 01.
c. X is a string such that it has odd 1's and even 0's.
d. X is a string such that it starts and ends as 1.

13. What does the following figure most correctly represents?



a. Final state with loop x.
b. Transitional state with loop x.
c. Initial state as well as final state with loop x.
d. Insufficient data.

14. Which of the following will not be accepted by the following DFA?



a. ababaabaa
b. abbbaa
c. abbbaabb
d. abbaabbaa

15. Which of the following will the given DFA won't accept?

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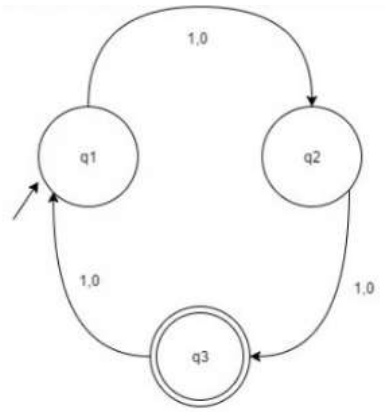

a. ε
b. 11010.
c. 10001010.
d. String of letter count 11.

16. Which of the following options is correct?
Statement 1: Initial State of NFA is Initial State of DFA.
Statement 2: The final state of DFA will be every combination of final state of NFA.
a) Statement 1 is true and Statement 2 is true
b) Statement 1 is true and Statement 2 is false
c) Statement 1 can be true and Statement 2 is true
d) Statement 1 is false and Statement 2 is also false

17. NFA, in its name has 'non-deterministic' because of:
a) the result is undetermined
b) the choice of path is non-deterministic
c) The state to be transited next is non-deterministic
d) All of the mentioned

18. Which of the following is correct proposition?
Statement 1: Non determinism is a generalization of Determinism.
Statement 2: Every DFA is automatically an NFA
a) Statement 1 is correct because Statement 2 is correct
b) Statement 2 is correct because Statement 1 is correct
c) Statement 2 is false and Statement 1 is false
d) Statement 1 is false because Statement 2 is false

19. Which of the following option is correct?
a) NFA is slower to process and its representation uses more memory than DFA
b) DFA is faster to process and its representation uses less memory than NFA
c) NFA is slower to process and its representation uses less memory than DFA
d) DFA is slower to process and its representation uses less memory than NFA

20. Which of the following is an application of Finite Automaton?
a) Compiler Design
b) Grammar Parsers
c) Text Search
d) All of the mentioned

21. John is asked to make an automaton which accepts a given string for all occurrences of 1001 in it. How many of transitions would john use such that the string processing application works?

a. 9
b. 11
c. 12
d. 15

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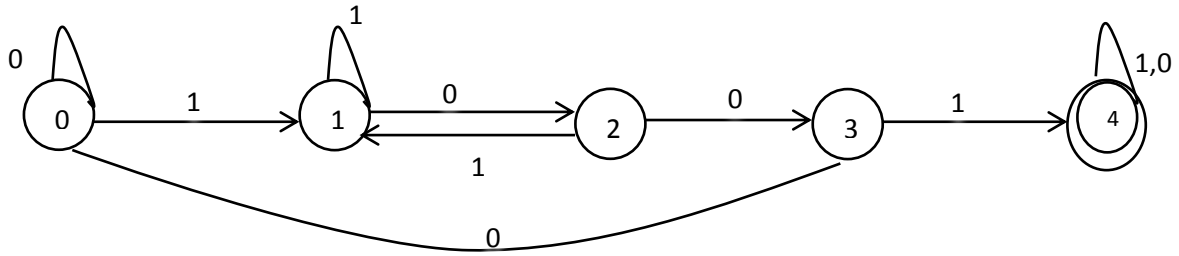
Note to solve this question, draw your FA, the following figure:



22. Which of the following do we use to form an NFA from a regular expression?

a) Subset Construction Method b) Power Set Construction Method
c) Thompson Construction Method d) Scott Construction Method

23. abb*c denotes which of the following?

a) {abnc|n=0} b) {abnc|n=1} c) {anbc|n=0} d) {abcn|n>0}

24. Which of the following strings do not belong the given regular expression? (a)*(a+cba)

a) aa b) aaa c) acba d) acbacba

25. Which of the following statements is false?

a) Context free language is the subset of context sensitive language.
b) Regular language is the subset of context sensitive language.
c) Recursively enumerable language is the super set of regular language.
d) Context sensitive language is a subset of context free language.

26. The entity which generate Language is termed as:

a) Automata b) Tokens c) Grammar d) Data

27. Which of the following pair of regular expression are not equivalent?

a) 1(01)* and (10)*1 b) x(xx)* and (xx)*x c) (ab)* and a*b* d) x+ and x*x+

28. ΦL is equivalent to ..... (In this question you are allowed to choose multiple answer)

a) LΦ b) Φ c) L d) ϵ

29. (a+b)* is equivalent to

a) b*a* b) (a*b*)* c) a*b* d) none of the mentioned

30. ϵL is equivalent to ..... (In this question you are allowed to choose multiple answer)

a) ϵ b) Φ c) L d) Lϵ

31. Regular expression Φ* is equivalent to

a) ϵ b) Φ c) 0 d) 1

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34. Precedence of regular expression in decreasing order is

a) * , . , + b) . , * , + c) . , + , * d) + , a , *

35. Regular expression {0,1} is equivalent to

a) 0 U 1 b) 0 | 1 c) 0 + 1 d) All of the mentioned

36. A regular language over an alphabet a is one that can be obtained from

a) union b) concatenation c) Kleene d) All of the mentioned

37. Conversion of a regular expression into its corresponding NFA:

a) Thompson's Construction Algorithm b) Powerset Construction

c) Kleene's algorithm d) None of the mentioned

38. Conversion of a finite automaton into its corresponding regular expression:

a) Thompson's Construction Algorithm b) Powerset Construction

c) Kleene's algorithm d) None of the mentioned

39. The following is or are an approach to process a regexp:

a) Contruction of NFA and subsequently, a DFA. b) Thompson's Contruction Algorithm

c) Both (a) and (b) d) None of the mentioned

40. Are the given two patterns equivalent? (1) gray|grey (2) gr(a|e)y

a) yes b) no

41. RR* can be expressed in which of the forms:

a) R+ b) R c) R+ U R d) R

42. Concatenation of R with Φ outputs:

a) R b) Φ c) R.Φ d) None of the mentioned

43. Concatenation Operation refers to which of the following set operations:

a) Union b) Dot c) Kleene d) Two of the options are correct

44. Which among the following looks similar to the given expression?

((0+1). (0+1)) *

a) {xϵ {0,1} *|x is all binary number with even length}

b) {xϵ {0,1} |x is all binary number with even length}

c) {xϵ {0,1} *|x is all binary number with odd length}

d) {xϵ {0,1} |x is all binary number with odd length}

45. Which of the following does not represents the given language?

Language: {0,01}

a) 0+01 b) {0} U {01} c) {0} U {0}{1} d) {0} ^ {01}

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46. Which of the following options is correct for the given statement?
Statement: If K is the number of states in NFA, the DFA simulating the same language would have states less than 2^k.
a) True b) False

47. Statement 1: NFA computes the string along parallel paths.
Statement 2: An input can be accepted at more than one place in an NFA.
Which among the following options are most appropriate?
a) Statement 1 is true while 2 is not b) Statement 1 is false while is not
c) Statement 1 and 2, both are true d) Statement 1 and 2, both are false

48. Predict the number of transitions required to automate the following language using only 3 states; L= {w | w ends with 00}
a) 3 b) 2 c) 4 d) cannot be said

49. The study of abstract computing devices or "machines".
a) Automata b) transaction process system c) logic system d) none of them

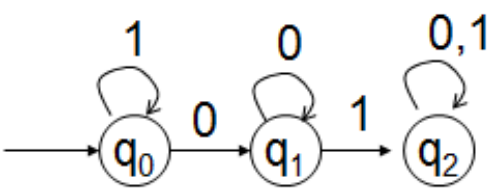
50. It is an abstraction of the general characteristics of programming languages.
a) Language b) natural language c) formal language d) All of them

51. It is a finite list of rules defining the language.
a) Language b) rules c) grammar d) all of them

52. According to the Chomsky hierarchy ..... Is the largest formal language scope.
a) recursively-enumerable(TM) b) regular c) context free d) none of them

53. The length of the following word w= *01* ε *0* ε *1* ε *00* ε is
a) 1 b) 10 c) 6 d) none of them

54. Which one of the following, that machine can exist in only one state at any given time.
a) DFA b) NDFA c) ε-NDFA d) none of them



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55. What is the type of automate machine, simulated in the previous figure?
a) DFA b) NDFA c) ε-NDFA d) none of them

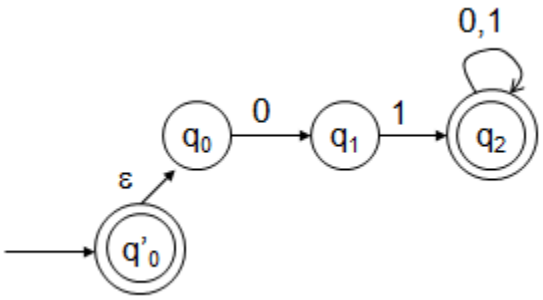
56. What is the language, simulated in the previous figure?
a) L= {w| w ends with 01} b) L= {w| w contains 01}
c) L= {w| w starts with 01} d) none of them

57. ……. Is member word for the previous automata?
a) 00101 b) 01001 c) 101000001 d) all of them

58. ……. can't accepted by the previous automata.
a) 00100 b) 111000 c) 11000001 d) all of them

59. The regular expression of the previous automata.
a) (0+1)*01(0+1)* b) (0+1) 01(0+1)* c) (0*+1*) 01(0*+1*) d) none of them

60. A language L is accepted by a DFA if and only if it is accepted by an
a) Regular expression b) ε-NDFA c) NDFA d) none of them



61. What is the type of automate machine, simulated in the previous figure?
a) DFA b) NDFA c) ε-NDFA d) none of them

62. What is the language, simulated in the previous figure?
a) L= {w| w ends with 01} b) L= {w| w is empty or ends with 01}
c) L= {w| w starts with 01} d) L= {w| w is empty or starts with 01}

63. .. ……. Is member word for the previous automata?
a) 00101 b) 01001 c) 101000001 d) all of them

64. ……. can't accepted by the previous automata.
a) 00100 b) 111000 c) 11000001 d) all of them

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65. The regular expression of the previous automata.

a) (0+1)*01(0+1)* b) (0+1) 01(0+1)* c) 0*1* (0*+1*) d) none of them

66. L*= {ε}, if L=….

a) {ε} b) ϕ c) {ε} or ϕ d) all of them

67. If we have the following regular expression (a (b+c)*)*d, this simulate the language

a) L= {w| w ends with ad} b) L= {w| w is empty or ends with d}

c) L= {w| w ends with d} d) none of them

58. If we have the following regular expression (a (b+c)*)*d. The word …… is accepted.

a) d b) aad c) abcd d) all of them

True or False

1. A language L is accepted by some ε-NFA if and only if L is accepted by some DFA. (T)
2. An NFA accepts *w* if *there exists at least one* path from the start state to an accepting state. (T)
3. for any language L. If L= {ε}, then L=ϕ. (F)
4. For any language L. with set of alphabets ∑, $L \subseteq \sum^*$. (T)
5. In non-deterministic finite automata, the machine can exist in multiple states at the same time. (T)
6. The transition functions in NFA mapping between Q x ∑ ==> Q. (F)
7. A parallel computer could exist in multiple “states” at the same time. (T)
8. In DFA, not all symbol transitions need to be defined explicitly. (F)
9. ∑* is set of all alphabets that form the language. (F)
10. Noam Chomsky considered the father of modern computer science. (F)