



BRAINWARE UNIVERSITY

Term End Examination 2021 - 22

Programme – Bachelor of Technology in Computer Science & Engineering

Course Name – Formal Language and Automata

Course Code - BCSE404

(Semester IV)

Time allotted : 1 Hrs.25 Min.

Full Marks : 70

[The figure in the margin indicates full marks.]

Group-A

(Multiple Choice Type Question)

1 x 70=70

Choose the correct alternative from the following :

- (1) There are _____ tuples in finite state machine
 - a) 4
 - b) 5
 - c) 6
 - d) Unlimited
- (2) Transition function maps
 - a) $\Sigma * Q \rightarrow \Sigma$
 - b) $Q * Q \rightarrow \Sigma$
 - c) $\Sigma * \Sigma \rightarrow Q$
 - d) $Q * \Sigma \rightarrow Q$
- (3) Language of finite automata is
 - a) Type 0
 - b) Type 1
 - c) Type 2
 - d) Type 3
- (4) Regular expression for all strings starts with ab and ends with bba is
 - a) $aba*b*bba$
 - b) $ab(ab)*bba$
 - c) $ab(a+b)*bba$
 - d) All of these
- (5) Number of states require to simulate a computer with memory capable of storing '3' words each of length '8'
 - a) $3*2^8$
 - b) $2^{(3*8)}$
 - c) $2^{(3+8)}$
 - d) None of these
- (6) A regular language over an alphabet a is one that can be obtained from
 - a) union
 - b) concatenation
 - c) kleene
 - d) All of these
- (7) Regular expression $\{0,1\}$ is equivalent to
 - a) $0 \cup 1$
 - b) $0 / 1$
 - c) $0 + 1$
 - d) All of these
- (8) Moore Machine is an application of:
 - a) Finite automata without input
 - b) Finite automata with output
 - c) Non- Finite automata with output
 - d) None of these
- (9) What is the output for the given language?

Language: A set of strings over $\Sigma = \{a, b\}$ is taken as input and it prints 1 as an output "for every occurrence of a, b as its substring. (INPUT: abaaab)

- a) 0010001
- b) 0101010
- c) 0111010
- d) 0010000

(10) It is less complex to prove the closure properties over regular languages using

- a) NFA
- b) DFA
- c) PDA
- d) Can't be said

(11) Which of the following is an application of Finite Automaton?

- a) Compiler Design
- b) Grammar Parsers
- c) Text Search
- d) All of these

(12) To derive a string using the production rules of a given grammar, we use:

- a) Scanning
- b) Parsing
- c) Derivation
- d) All of these

(13) A PDA machine configuration (p, w, y) can be correctly represented as

- a) (current state, unprocessed input, stack content)
- b) (unprocessed input, stack content, current state)
- c) (current state, stack content, unprocessed input)
- d) None of these

(14) If the PDA does not stop on an accepting state and the stack is not empty, the string is:

- a) rejected
- b) goes into loop forever
- c) both rejected & goes into loop forever
- d) None of these

(15) A language accepted by Deterministic Push down automata is closed under which of the following?

- a) Complement
- b) Union
- c) both Complement and Union
- d) None of these

(16) Which of the following does not have left recursions?

- a) Chomsky Normal Form
- b) Greibach Normal Form
- c) Backus Naur Form
- d) All of these

(17) Every grammar in Chomsky Normal Form is:

- a) regular
- b) context sensitive
- c) context free
- d) All of these

(18) In which of the following, does the CNF conversion find its use?

- a) CYK Algorithm
- b) Bottom up parsing
- c) Preprocessing step in some algorithms
- d) All of these

(19) Which among the following can be an example of application of finite state machine(FSM)?

- a) Communication Link
- b) Adder
- c) Stack
- d) None of these

(20) Predict the number of transitions required to automate the following language using only 3 states:

$$L = \{w \mid w \text{ ends with } 00\}$$

- a) 3
- b) 2
- c) 4
- d) cannot be said

(21) The total number of states to build the given language using DFA:

$$L = \{w \mid w \text{ has exactly 2 a's and at least 2 b's}\}$$

- a) 10
- b) 11
- c) 12
- d) 13

(22) $L_1 = \{w \mid w \text{ does not contain the string } tr\}$

$$L_2 = \{w \mid w \text{ does contain the string } tr\}$$

Given $\Sigma = \{t, r\}$, The difference of the minimum number of states required to form L1 and L2?

- a) 0
- b) 1
- c) 2
- d) cannot be said

(23) In mealy machine, the O/P depends upon?

- a) State
- b) Previous State
- c) State and Input
- d) Only Input

(24) Mealy and Moore machine can be categorized as:

- a) Inducers
- b) Transducers
- c) Turing Machines
- d) Linearly Bounded Automata

(25) The major difference between Mealy and Moore machine is about:

- a) Output Variations
- b) Input Variations
- c) Both Output Variations and Input Variations
- d) None of these

(26) Statement 1: Mealy machine reacts faster to inputs.

Statement 2: Moore machine has more circuit delays.

Choose the correct option:

- a) Statement 1 is true and Statement 2 is true
- b) Statement 1 is true but Statement 2 is false
- c) Statement 1 is false and Statement 2 is true
- d) None of the mentioned is true

(27) Which of the following is not a regular expression?

- a) $[(a+b)^*(aa+bb)]^*$
- b) $[(0+1)-(0b+a1)^*(a+b)]^*$
- c) $(01+11+10)^*$
- d) $(1+2+0)^*(1+2)^*$

(28) Which of the following statements is not true?

- a) Every language defined by any of the automata is also defined by a regular expression
- b) Every language defined by a regular expression can be represented using a DFA
- c) Every language defined by a regular expression can be represented using NFA with ϵ moves
- d) Regular expression is just another representation of any automata definition

(29) The minimum number of states required in a DFA (along with a dumping state) to check whether the 3rd bit is 1 or not for $|n| \geq 3$

- a) 3
- b) 4
- c) 5
- d) 1

(30) Generate a regular expression for the given language: $L(x) = \{x \in \{0,1\}^* \mid x \text{ ends with } 1 \text{ and does not contain a substring } 01\}$

- a) $(0+01)^*$
- b) $(0+01)^*1$
- c) $(0+01)^*(1+01)$
- d) All of them

(31) The minimum number of transitions to pass to reach the final state as per the following regular expression is: $\{a,b\}^* \{baaa\}$

- a) 4
- b) 5
- c) 6
- d) 3

(32) 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 these

(33) A Turing machine is a

- a) real machine
- b) abstract machine
- c) hypothetical machine
- d) more than one option is correct

(34) The context free languages are closed under:

- a) Intersection
- b) Complement

c) Kleene

d) None of these

(35) Given Grammar G1:

$S \rightarrow aSb$

$S \rightarrow \epsilon$

Grammar G2:

$R \rightarrow cRd$

$R \rightarrow \epsilon$

If $L(G) = L(G1) \cup L(G2)$, the number of productions the new starting variable would have:

a) 2

b) 3

c) 4

d) 1

(36) If the start symbol is one of those symbols which produce no terminal through any sequence, the CFL is said to be

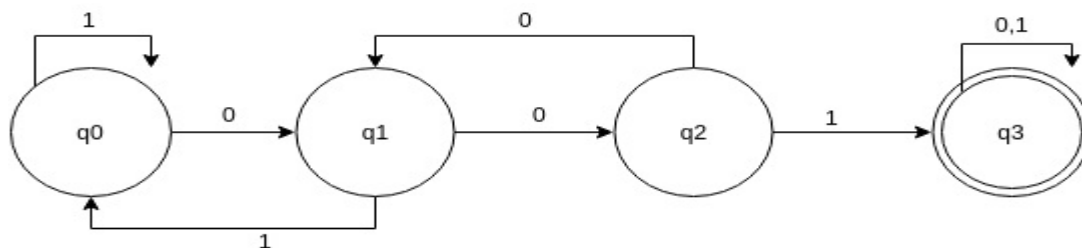
a) nullable

b) empty

c) eliminated

d) None of these

(37) Which of the following is same as the given DFA?



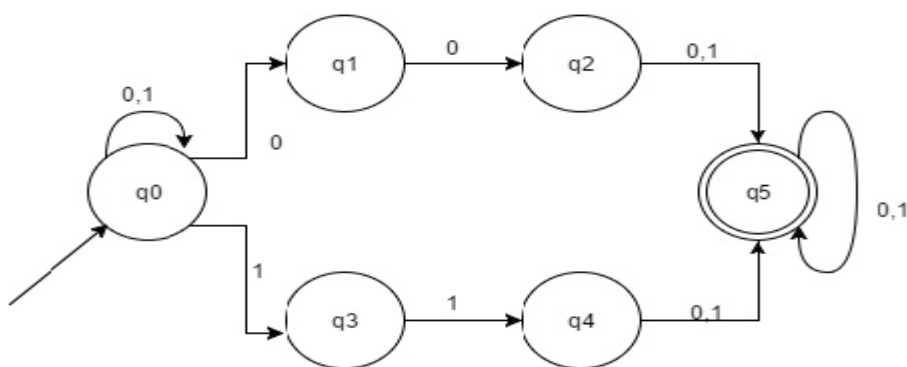
a) $(0+1)^*001(0+1)^*$

b) $1^*001(0+1)^*$

c) $(01)^*(0+0+1)(01)^*$

d) None of these

(38) The given NFA corresponds to which of the following Regular expressions?



a) $(0+1)^*(00+11)(0+1)^*$

b) $(0+1)^*(00+11)^*(0+1)^*$

c) $(0+1)^*(00+11)(0+1)$

d) $(0+1)(00+11)(0+1)^*$

(39) If $L1$ and $L2$ are context free languages, $L1 \cdot L2$ are context free:

a) always

b) sometimes

c) never

d) none of the mentioned

(40) Let $T = \{p, q, r, s, t\}$. The number of strings in S^* of length 4 such that no symbols can be repeated.

a) 120

b) 625

c) 360

d) 36

- (41) Which of the following is analogous to the following? :NFA and NPDA
- a) Regular language and Context Free language b) Regular language and Context Sensitive language
c) Context free language and Context Sensitive language d) None of the mentioned
- (42) A _____ is context free grammar with atmost one non terminal in the right handside of the production.
- a) linear grammar b) linear bounded grammar
c) regular grammar d) none of the mentioned
- (43) If L1 and L2 are context free languages, L1-L2 are context free:
- a) always b) sometimes
c) never d) none of the mentioned
- (44) Which of the following statement is false in context of tree terminology?
- a) Root with no children is called a leaf b) A node can have three children
c) Root has no parent d) Trees are collection of nodes, with a parent child relationship
- (45) In which order are the children of any node ordered?
- a) From the left b) From the right
c) Arbitrarily d) None of the mentioned
- (46) Which of the following are distinct to parse trees?
- a) abstract parse trees b) sentence diagrams
c) both abstract parse trees and sentence diagrams d) none of the mentioned
- (47) A symbol X is called to be useful if and only if its is:
- a) generating b) reachable
c) both generating and reachable d) none of the mentioned
- (48) Grammar is checked by which component of compiler
- a) Scanner b) Parser
c) Semantic Analyzer d) None of the mentioned
- (49) Finite-state acceptors for the nested words can be:
- a) nested word automata b) push down automata
c) ndfa d) none of the mentioned
- (50) With reference of a DPDA, which among the following do we perform from the start state with a n empty stack?
- a) process the whole string b) end in final state
c) end with an empty stack d) all of the mentioned
- (51) A PDA machine configuration (p, w, y) can be correctly represented as:
- a) current state, unprocessed input, stack content b) unprocessed input, stack content, current state
c) current state, stack content, unprocessed input d) none of the mentioned
- (52) Which of the following strings is not generated by the given grammar: $S \rightarrow SaSbS|e$
- a) aabb b) abab
c) abaabb d) None of the mentioned
- (53) Which of the following regular expression allows strings on $\{a,b\}^*$ with length n where n is a multiple of 4.
- a) $(a+b+ab+ba+aa+bb+aba+bab+abab+baba)^*$ b) $(bbbb+aaaa)^*$
c) $((a+b)(a+b)(a+b)(a+b))^*$ d) None of the mentioned
- (54) Which of the following is an incorrect regular expression identity?
- a) $R+f=R$ b) $eR=e$
c) $Rf=f$ d) None of the mentioned

(55) Context free languages are not closed under:

- a) Intersection
- b) Intersection with Regular Language
- c) Complement
- d) All of the mentioned

(56) The ability for a system of instructions to simulate a Turing Machine is called _____

- a) Turing Completeness
- b) Simulation
- c) Turing Halting
- d) None of the mentioned

(57) Generate a regular expression for the given language: $L(x) = \{x \in \{0,1\}^* \mid x \text{ ends with } 1 \text{ and does not contain a substring } 01\}$

- a) $(0+01)^*$
- b) $(0+01)^*1$
- c) $(0+01)^*(1+01)$
- d) All of the mentioned

(58) All the regular languages can have one or more of the following descriptions: i) DFA ii) NFA iii) e-NFA iv) Regular Expressions Which of the following are correct?

- a) i, ii, iv
- b) i, ii, iii
- c) i, iv
- d) i, ii, iii, iv

(59) What is the output for the given language? Language: A set of strings over $\Sigma = \{a, b\}$ is taken as input and it prints 1 as an output "for every occurrence of a, b as its substring. (INPUT: abaaab)

- a) 0010001
- b) 0101010
- c) 0111010
- d) 0010000

(60) Regular expression for all strings starts with ab and ends with bba is.

- a) aba^*b^*bba
- b) $ab(ab)^*bba$
- c) $ab(a+b)^*bba$
- d) All of the mentioned

(61) Which among the following is not an application of FSM?

- a) Lexical Analyser
- b) BOT
- c) State charts
- d) None of the mentioned

(62) Design a NFA for the language: $L = \{an \mid n \text{ is even or divisible by } 3\}$ Which of the following methods can be used to simulate the same.

- a) e-NFA
- b) Power Construction Method
- c) Both (a) and (b)
- d) None of the mentioned

(63) Which of the production rule can be accepted by Chomsky grammar?

- a) $A \rightarrow BC$
- b) $A \rightarrow a$
- c) $S \rightarrow e$
- d) All of the mentioned

(64) Statement 1: Null string is accepted in Moore Machine. Statement 2: There are more than 5-Tuples in the definition of Moore Machine.

- a) Statement 1 is true and Statement 2 is true
- b) Statement 1 is true while Statement 2 is false
- c) Statement 1 is false while Statement 2 is true
- d) Statement 1 and Statement 2, both are false

(65) Number of states require to simulate a computer with memory capable of storing '3' words each of length '8'.

- a) $3 * 28$
- b) $2(3*8)$
- c) $2(3+8)$
- d) None of the mentioned

(66) Generate a regular expression for the following problem statement: Password Validation: String should be 8-15 characters long. String must contain a number, an Uppercase letter and a Lower case letter.

- a) $^(?=.*[a-z])(?=.*[A-Z])(?=.*\d).\{8,15\}$$
- b) $^(?=.*[a-z])(?=.*[A-Z])(?=.*\d).\{9,16\}$$
- c) $^(?=.*[a-z])(?=.*[A-Z])(?=.*\d).\{8,15\}$$
- d) None of the mentioned

(67) Generate a regular expression for the following problem statement: $P(x)$: String of length 6 or less for $\Sigma = \{0,1\}^*$

- a) $(1+0+e)^6$
- b) $(10)^6$
- c) $(1+0)(1+0)(1+0)(1+0)(1+0)(1+0)$
- d) More than one of the mentioned is correct

(68) The _____ of a set of states, P, of an NFA is defined as the set of states reachable from any

state in P following e-transitions.

a) e-closure

b) e-pack

c) Q in the tuple

d) None of the mentioned

(69) What is the relation between DFA and NFA on the basis of computational power?

a) DFA > NFA

b) NFA > DFA

c) Equal

d) Can't be said

(70) 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