



# BRAINWARE UNIVERSITY

## Term End Examination 2021 - 22

### Programme – Master of Computer Applications

### Course Name – Formal Language and Automata Theory

### Course Code - MCA205

### ( Semester II )

Time allotted : 1 Hrs.15 Min.

Full Marks : 60

[The figure in the margin indicates full marks.]

#### Group-A

(Multiple Choice Type Question)

1 x 60=60

Choose the correct alternative from the following :

- (1) There are \_\_\_\_\_ tuples in the finite state machine
  - a) 4
  - b) 5
  - c) 6
  - d) Unlimited
- (2) Number of states required to accept string ends with 10
  - a) 3
  - b) 2
  - c) 1
  - d) Can't be determined
- (3) Languages of a automata is
  - a) If it is accepted by automata
  - b) If it halts
  - c) If automata touch final state in its lifetime
  - d) All language are language of automata
- (4) Finite automata requires minimum \_\_\_\_\_ number of stacks
  - a) 1
  - b) 0
  - c) 2
  - d) None of the mentioned
- (5) 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
- (6) The basic limitation of finite automata is that
  - a) It can't remember an arbitrary large amount of information
  - b) It sometimes recognizes grammar that is not regular
  - c) It sometimes fails to recognize regular grammar
  - d) All of the mentioned
- (7) 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
  - d) Statement 1 is false and Statement 2 is also

false

true

(8) An automaton that presents output based on previous state or current input:

- a) Acceptor
- b) Classifier
- c) Transducer
- d) None of the mentioned

(9) 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

(10) Given Language  $L = \{x \in \{a, b\}^* | x \text{ contains } aba \text{ as its substring}\}$  Find the difference of transitions made in constructing a DFA and an equivalent NFA?

- a) 2
- b) 3
- c) 4
- d) Cannot be determined.

(11) 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

(12) Which among the following is not notated as infinite language

- a) Palindrome
- b) Reverse
- c) Factorial
- d)  $L = \{ab\}^*$

(13) In Moore machine, output is produced over the change of:

- a) transitions
- b) states
- c) Both
- d) None of the mentioned

(14) Which of the given are correct

- a) Moore machine has 6-tuples
- b) Mealy machine has 6-tuples
- c) Both Mealy and Moore has 6-tuples
- d) None of the mentioned

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

- a) Output Variations
- b) Input Variations
- c) Both
- d) None of the mentioned

(16) FSM with output capability can be used to add two given integers in binary representation. This is

- a) True
- b) False
- c) May be true
- d) None of the mentioned

(17) Which of the following does not represent the given language? Language:  $\{0,01\}$

- a)  $0+01$
- b)  $\{0\} \cup \{01\}$
- c)  $\{0\} \cup \{0\}\{1\}$
- d)  $\{0\} \wedge \{01\}$

(18) Which among the following looks similar to the given expression?  $((0+1). (0+1))^*$

- a)  $\{x \in \{0,1\}^* | x \text{ is all binary number with even length}\}$
- b)  $\{x \in \{0,1\} | x \text{ is all binary number with even length}\}$
- c)  $\{x \in \{0,1\}^* | x \text{ is all binary number with odd length}\}$
- d)  $\{x \in \{0,1\} | x \text{ is all binary number with odd length}\}$

(19)  $RR^*$  can be expressed in which of the forms:

- a)  $R^+$
- b)  $R^-$
- c)  $R^+ \cup R^-$
- d)  $R$

(20) The total number of states required to automate the given regular expression  $(00)^*(11)^*$

- a) 3
- b) 4

- c) 5 d) 6
- (21) 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
- (22) Generate a regular expression for the given language:  $L(x): \{x \in \{0,1\}^* \mid x \text{ ends with 1 and does not contain a substring 01}\}$
- a)  $(0+01)^*$  b)  $(0+01)^*1$   
c)  $(0+01)^*(1+01)$  d) All of the mentioned
- (23) While applying Pumping lemma over a language, we consider a string  $w$  that belongs to  $L$  and fragment it into \_\_\_\_\_ parts.
- a) 2 b) 5  
c) 3 d) 6
- (24) 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
- (25) Fill in the blank in terms of  $p$ , where  $p$  is the maximum string length in  $L$ . Statement: Finite languages trivially satisfy the pumping lemma by having  $n =$  \_\_\_\_\_
- a)  $p*1$  b)  $p+1$   
c)  $p-1$  d) None of the mentioned
- (26) Which of the following one can relate to the given statement: Statement: If  $n$  items are put into  $m$  containers, with  $n > m$ , then at least one container must contain more than one item.
- a) Pumping lemma b) Pigeon Hole principle  
c) Count principle d) None of the mentioned
- (27) If we have more than one accepting states or an accepting state with an outdegree, which of the following actions will be taken?
- a) addition of new state b) removal of a state  
c) make the newly added state as final d) more than one option is correct
- (28) Which of the following methods is suitable for conversion of DFA to RE?
- a) Brzozowski method b) Arden's method  
c) Walter's method d) All of the mentioned
- (29) 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
- (30) A language is regular if and only if
- a) accepted by DFA b) accepted by PDA  
c) accepted by LBA d) accepted by Turing machine
- (31) 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)  $(1+2+0)^*(1+2)^*$
- (32) Which of the following is true?
- a) Every subset of a regular set is regular b) Every finite subset of non-regular set is regular

- c) The union of two non-regular set is not regular
- d) Infinite union of finite set is regular
- (33) 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
- (34) Which of the following can refer to a language to be non-regular
- a) Pumping Lemma
- b) Myhill Nerode
- c) Both (a) and (b)
- d) None of the mentioned
- (35) 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
- (36) Production Rule:  $aAb \rightarrow agb$  belongs to which of the following category
- a) Regular Language
- b) Context free Language
- c) Context Sensitive Language
- d) Recursively Enumerable Language
- (37) The Grammar can be defined as:  $G=(V, \Sigma, p, S)$  In the given definition, what does S represent?
- a) Accepting State
- b) Starting Variable
- c) Sensitive Grammar
- d) None of these
- (38) Which of the expression is appropriate? For production  $p: a \rightarrow b$  where  $a \in V$  and  $b \in \underline{\hspace{2cm}}$
- a)  $V$
- b)  $S$
- c)  $(V+\Sigma)^*$
- d)  $V+\Sigma$
- (39) The minimum number of productions required to produce a language consisting of palindrome strings over  $\Sigma=\{a,b\}$  is
- a) 3
- b) 7
- c) 5
- d) 6
- (40) Which of the following is not a notion of Context free grammars
- a) Recursive Inference
- b) Derivations
- c) Sentential forms
- d) All of the mentioned
- (41) If  $w$  belongs to  $L(G)$ , for some CFG, then  $w$  has a parse tree, which defines the syntactic structure of  $w$ .  $w$  could be:
- a) program
- b) SQL-query
- c) XML document
- d) All of the mentioned
- (42) An expression is mentioned as follows. Figure out the number of incorrect notations or symbols, such that a change in those could make the expression correct.  $L(G)=\{w \text{ in } T^* | S \rightarrow *w\}$
- a) 0 Errors
- b) 1 Errors
- c) 2 Errors
- d) Invalid Expression
- (43) Which among the following is the correct option for the given grammar?  $G-\>X111|G1, X \rightarrow X0|00$
- a)  $\{0^a 1^b | a=2, b=3\}$
- b)  $\{0^a 1^b | a=1, b=5\}$
- c)  $\{0^a 1^b | a=b\}$
- d) More than one of the mentioned is correct
- (44) Choose the correct option: Statement: There exists two inference approaches: a) Recursive Inference b) Derivation

- a) true
  - b) false
  - c) partially true
  - d) none of the mentioned
- (45) Which of the following statements are correct for a concept called inherent ambiguity in CFL
- a) Every CFG for L is ambiguous
  - b) Every CFG for L is unambiguous
  - c) Every CFG is also regular
  - d) None of the mentioned
- (46) A symbol X is called to be useful if and only if it is:
- a) generating
  - b) reachable
  - c) both generating and reachable
  - d) none of the mentioned
- (47) If  $|w| \geq 2^h$ , then its parse tree's height is at least \_\_\_\_\_
- a) h
  - b) h+1
  - c) h-1
  - d)  $2^h$
- (48) 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
- (49) A CFG is ambiguous if
- a) It has more than one rightmost derivations
  - b) It has more than one leftmost derivations
  - c) No parse tree can be generated for the CFG
  - d) None of the mentioned
- (50) A CFG is not closed under
- a) Dot operation
  - b) Union Operation
  - c) Concatenation
  - d) Iteration
- (51) Which of the following allows stacked values to be sub-stacks rather than just finite symbols
- a) Push Down Automaton
  - b) Turing Machine
  - c) Nested Stack Automaton
  - d) None of the mentioned
- (52) Push down automata accepts \_\_\_\_\_ languages.
- a) Type 3
  - b) Type 2
  - c) Type 1
  - d) Type 0
- (53) Which of the operations are eligible in PDA?
- a) Push
  - b) Delete
  - c) Insert
  - d) Pop
- (54) The following move of a PDA is on the basis of:
- a) Present state
  - b) Input Symbol
  - c) Both (a) and (b)
  - d) None of the mentioned
- (55) The closure property of context free grammar includes
- a) Kleene
  - b) Concatenation
  - c) Union
  - d) All of the mentioned
- (56) Which of the following automata takes queue as an auxiliary storage?
- a) Finite automata
  - b) Turing machine
  - c) Push down automata
  - d) All of the mentioned
- (57) A null production can be referred to as:
- a) String
  - b) Symbol
  - c) Word
  - d) All of the mentioned
- (58) NPDA stands for

a) Non-Deterministic Push Down Automata

c) Nested Push Down Automata

b) Null-Push Down Automata

d) All of the mentioned

(59) Halting states are of two types. They are:

a) Accept and Reject

c) Start and Reject

b) Reject and Allow

d) None of the mentioned

(60) Which of the following correctly recognize the symbol '|-' in context to PDA?

a) Moves

c) or/not symbol

b) transition function

d) none of the mentioned

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