REV-01
BCA/02/06

2025/11

SET A

BACHELOR OF COMPUTER APPLICATION[HONS WITH RESEARCH]

SEVENTH SEMESTER
THEORY OF COMPUTATION
BCAR-703

[USE OMR FOR OBJECTIVE PART]

Duration: 3 hrs. **Full Marks: 70**

Objective

Time: 30 min. **Marks: 20**

Choose the correct answer from the following: *1X20=20*

1. A final state, as well as an initial state in a transition diagram, is denoted by

   a.
   b.
   c.
   d. None of the above

2. A Deterministic Finite Automata(DFA) is a simple
   a. Function recognition device
   b. Language recognition device
   c. Routine recognition device
   d. None of the above

3. Which of the following is false for FA, **M=({q0, q1},{a,b},δ, q0,{q1})**
   a. q0∈ Q
   b. q0 ∈F
   c. abb ∈ $\sum^*$
   d. None of the above

4. The regular expression having all strings of 0's and 1's with two consecutive 0's is
   a. (0+1)
   b. (0+1)*
   c. (0+ε)(1+10)*
   d. (0+1)*011

5. If a regular expression R = (0+1)*11, which of the following strings is not accepted?
   a. 011
   b. 1101
   c. 1011
   d. 011

6. For the grammar S → aS | Sb | ε, which of the following strings is generated?
   a. ab
   b. ba
   c. aabb
   d. Option a) and c)

7. In a context-free grammar, the right-hand side of a production
   a. Combination of Terminals and Non Terminals
   b. Only Non terminals
   c. Only Terminals
   d. None of the above

8. Which of the following is not accepted by any finite automaton?
   a. All strings with equal number of 0s and 1s
   b. Strings ending with "10"
   c. Strings having substring "00"
   d. Strings starting with "1"

9. Which one of the following is a finite automaton?

a. DFA
b. NFA
c. PDA
d. Both a and b

10. Which automaton allows ε (epsilon) transitions?
a. DFA
b. NFA
c. PDA
d. Turing Machine

11. The symbol ε represents
a. End of input
b. Null string
c. Empty transition
d. Both b) and c)

12. What is the regular expression for all strings over {a, b} containing "ab" as a substring?
a. (a+b)ab(a+b)
b. ab(a+b)*
c. (a+b)*ba*(a+b)*
d. (ab)*

13. The empty set is represented by
a. ∅
b. ε
c. {}
d. None

14. If a DFA has one start state and two final states, it can have how many total states
a. 2
b. 3
c. 1
d. 4

15. A parse tree represents
a. Grammar derivation steps
b. Regular expression
c. DFA transitions
d. NFA closure

16. In the Chomsky hierarchy, which type of grammar is most powerful?
a. Type 0
b. Type 1
c. Type 2
d. All the above

17. Which of the following is *not* a component of a finite automaton?
a. Set of states
b. Set of input alphabet
c. Set of transition functions
d. Stack

18. An NFA can have:
a. Multiple initial states
b. Both initial and final multiple states
c. Multiple final states
d. None of the above

19. Which of the following represents "all strings starting with 'a'" over {a, b}?
a. a(a+b)*
b. (a+b)a
c. (a+b)
d. b(a+b)*

20. In the Chomsky hierarchy, Type-3 grammar is also called
a. Context-free
b. Context-sensitive
c. Regular
d. Unrestricted

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(Descriptive)

Time : 2 hrs. 30 min. **Marks : 50**

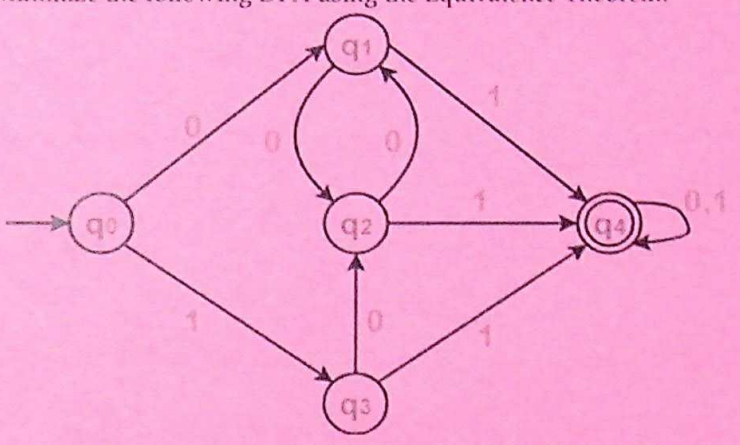
[Answer question no.1 & any four (4) from the rest]

1. What is the main concept of automaton? What do you mean by Alphabet,String,EmptyString and Language in automata theory,give suitable example. **2+8=10**

2. Draw a DFA for the language accepting strings ending with 'abba' over input alphabets ∑ = {a, b}. also, write the transition table of the required DFA. **5+5=10**

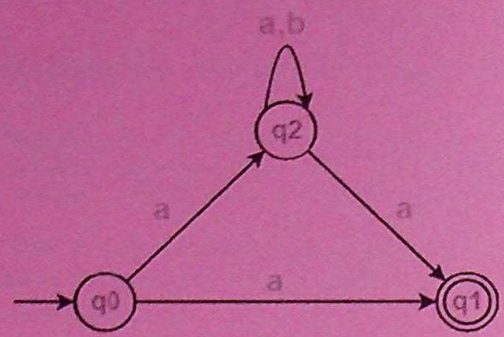
3. Construct a DFA that accepts a language L over input alphabets ∑ = {a, b} such that L is the set of all strings starting with 'aa' or 'bb'. **10**

4. Minimize the following DFA using the Equivalence Theorem. **10**



5. a) Explain the Chomsky Hierarchy briefly, accompanied by a proper diagrammatic representation. **5+5=10**
   b) Define the formal definition of DFA and NFA. Also, write the key difference between DFA and NFA.

6. Convert the following Non-Deterministic Finite Automata (NFA) to Deterministic Finite Automata (DFA)- 10



7. Consider the grammar- 10

S → bB / aA
A → b / bS / aAA
B → a / aS / bBB

For the string w = bbaababa, find-

a) Leftmost derivation
b) Rightmost derivation
c) Parse Tree

8. **Define the terms:** 2×5=10

a) Ambiguous Grammar
b) Unambiguous Grammar
c) Kleene Star and Kleene Plus operations.
d) Dead State and Inaccessible state
e) Alphabet

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