BRAINWARE UNIVERSITY

Term End Examination 2023
Programme – MCA-2020/MCA-2021
Course Name – Formal Language and Automata Theory
Course Code - MCA205
(Semester II)

Full Marks : 60   **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)   1 x 15=15

1. *Choose the correct alternative from the following :*

(i)   The password to the admins account=”administrator”. Write the total number of states required to make a password-pass system using DFA would be

   a) …..14   b) ….13
   c) ….12   d) A password pass system cannot be created using DFA

(ii)   Select from following which is a nonterminal symbol in a context-free grammar?

   a) a   b) b
   c) S   d) None of the above

(iii)   Select from the following production in a context-free grammar?

   a) A rule that specifies how to derive a string in the language from a nonterminal symbol   b) A rule that specifies how to derive a nonterminal symbol from a terminal symbol
   c) A rule that specifies how to derive a terminal symbol from a nonterminal symbol   d) None of the above

(iv)   Select the derivation in a context-free grammar?

   a) A sequence of productions that generates a string in the language   b) A sequence of terminals and nonterminals that cannot be further derived
   c) A sequence of symbols that cannot be derived from the start symbol   d) None of the above

(v)   Select the start symbol in a context-free grammar.

   a) The first nonterminal symbol in the grammar   b) The symbol that specifies the beginning of a string in the language
   c) The symbol that is used to derive all other symbols in the grammar   d) None of the above

(vi) Select an example of a context-free grammar

a) S → aS | ε

b) S → AB | aS

c) S → AB | ε

d) None of the above

(vii) choose the halting problem in automata theory?

a) The problem of determining whether a given Turing machine will halt on a given input.

b) The problem of determining the time complexity of a given algorithm.

c) The problem of determining the space complexity of a given algorithm.

d) The problem of determining whether a given algorithm is correct.

(viii) Choose the right one:Can the halting problem be solved in general for all Turing machines?

a) Yes, it can be solved for all Turing machines.

b) No, it cannot be solved for any Turing machine.

c) It can be solved for some Turing machines but not all

d) It can be solved for all deterministic Turing machines.

(ix) Select the application of Moore machine.

a) Finite automata without input(N)

b) Finite automata with output(Y)

c) Non- Finite automata with output(N)

d) None of the mentioned(N)

(x) Identify how many tuples in the finite state machine

a) ..4

b) ..5

c) ..6

d) Unlimited

(xi) Show the Transition function maps

a) Σ * Q -> Σ

b) Q * Q -> Σ

c) Σ * Σ -> Q

d) Q * Σ -> Q

(xii) write the Number of states required to accept string ends with 10

a) ..3

b) ..2

c) ..1

d) Can't be determined(N)

(xiii) Identify δ*(q,ya) is equivalent to

a) δ((q,y),a)

b) δ(δ*(q,y),a)

c) δ(q,ya)

d) independent from δ notation

(xiv) Write 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}

(xv) choose similirairty for the given expression?((0+1). (0+1)) *

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

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

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

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

Group-B
(Short Answer Type Questions)   3 x 5=15

2. Explain the concept of automata and give an example of a simple automaton.   (3)
3. Explain what is meant by the term "language accepted by an automaton".   (3)
4. Differenciate Between The Strings And The Words Of A Language?   (3)
5. Use the Pumping Lemma to Analyse that the language L = {0^n1^m0^m | n, m >= 0} is not   (3)
   regular.
6. Differentiate between regular languages and context-free languages?   (3)

OR

Explain the concept of regular grammars and how they relate to regular languages (3)

Group-C
(Long Answer Type Questions) 5 x 6=30

7. Write a context-free grammar for the language of all well-formed XML documents. (5)
8. Show that the language recognized by a finite automaton is regular. (5)
9. Explain how the Myhill-Nerode theorem can be used to show that a language is not regular. (5)
10. Explain with an example of a regular language that is not a regular set. (5)
11. Differentiate between a left-recursive and a right-recursive grammar (5)
12. Explain about parse tree in context-free grammar? (5)

OR

Explain about Chomsky normal form for context-free grammars? (5)

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