

# MCA-18

## Formal Language and Automata

Master of Computer Application(MCA-11/16/17)

Fifth Semester Examination, 2019 (June)

**Time : 3 Hours]**

**Max. Marks : 80**

**Note :** This paper is of Eighty (80) marks divided into three (03) sections A, B and C. Attempt the questions contained in these sections according to the detailed instructions given therein.

### SECTION-A

#### (Long Answer Type Questions)

**Note :** Section 'A' contains four (04) long answer type questions of Nineteen (19) marks each. Learners are required to answer any two (02) questions only.

(2×19=38)

1. (a) What do you understand by finite Representation of languages?

- (b) Draw a deterministic and non-deterministic finite automata which accept 00 and 11 at the end of a string containing 0,1 in it, e.g., 01010100 but not 00011010.
2. (a) What is halting problem? Explain in detail.  
(b) Construct turing machine for  $L = \{a^n b^n c^n \mid n \geq 1\}$ .
3. (a) What is the difference between finite automata and push down automata?  
(b) Design a turing machine which can perform subtraction operation.
4. (a) What is content free grammar?  
(b) What do you understand by Church 'Thesis'? Explain.

## SECTION-B

### (Short Answer Type Questions)

**Note :** Section 'B' contains eight (08) short answer type questions of eight (08) marks each. Learners are required to answer any four (04) questions only. (4×8=32)

1. Define Pumping Lemma. Write the applications of pumping lemma for regular languages.

2. Define Chomsky hierarchy of languages.
3. What is the difference between top-down parsing and bottom-up parsing? Explain with the help of example.
4. Define LR(0) grammar with suitable example and its application.
5. Explain transition diagram, transition table with example.
6. Define transition function of DFA.
7. What is the difference between an Alphabet and an Element of a Set ? Whether alphabet is an Element of a Set or it is a Set itself?
8. What is the difference between finite Automata and Transition graph ? Why we need Transition graph when we have Finite Automata?

**SECTION-C**  
**(Objective Type Questions)**

**Note :** Section 'C' contains ten (10) objective type questions of one (01) mark each. All the questions of this section are compulsory. (10×1=10)

1. Transition function maps.

(a)  $\Sigma^*Q \rightarrow \Sigma$

(b)  $Q^*Q \rightarrow \Sigma$

(c)  $\Sigma^*\Sigma \rightarrow Q$

(d)  $Q^* \Sigma \rightarrow Q$

2.  $\delta(q, ya)$  is equivalent to.

(a)  $\delta(q, y), a$

(b)  $\delta(\delta^*(q, y), a)$

(c)  $\delta(q, ya)$

(d) independent from  $\delta$  notation.

3. Which of the following cannot be filled in the blank below?
- Statement: There are CFLs  $L_1$  and  $L_2$  so that \_\_\_\_\_ is not a CFL.
- (a)  $L_1 \cap L_2$
  - (b)  $L_1'$
  - (c)  $L_1^*$
  - (d) None of the mentioned
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 the mentioned
5. Languages of a automata is
- a) If it is accepted by automata
  - (b) If it halts
  - (c) If automata touch final state in its life time
  - (d) All language are language of automata

6. 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.

7. Which among the following are the boolean operations that under which regular languages are closed?

- (a) Union
- (b) Intersection
- (c) Complement
- (d) All of The Mentioned.

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 the mentioned.

9. In mealy machine, the O/P depends upon
- (a) State
  - (b) Previous State
  - (c) State and Input
  - (d) Only input.
10. Under which of the following operation, NFA is not closed?
- (a) Negation
  - (b) Kleene
  - (c) Concatenation
  - (d) None of the mentioned .
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