



**B.Tech V Semester Supplementary Examinations, July 2022**  
**THEORY OF COMPUTATION**  
*(Computer Science and Engineering)*

**Maximum Marks: 70**

Date:05.07.2022 Duration: 3 hours

- Note:**
1. This question paper contains two parts A and B.
  2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
  3. Part B consists of 5 Units. Answer any one full question from each unit.
  4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 Give structural representations of Finite Automata.
- 2 Write any two differences between NFA and DFA.
- 3 What are the applications of Regular Expressions.
- 4 List the principal closure properties of Regular Languages.
- 5 Define Context Free Grammar(CFG) with an example.
- 6 Define Push Down Automata(PDA).
- 7 What is CNF(Chomsky Normal Form)?
- 8 Give 7-tuple representation for Turing machine.
- 9 Define Post's corresponding problem.
- 10 List any two NP-complete problems.

Part-B

Answer All the following questions.

(10M X 5=50Marks)

- 11 a) Define Finite Automata and explain NFA and DFA with an Example. [5M]
- b) Convert the following NFA to equivalent DFA [5M]

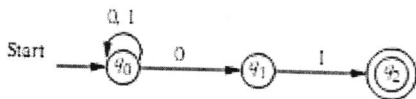


Figure An NFA accepting all strings that end in 01

OR

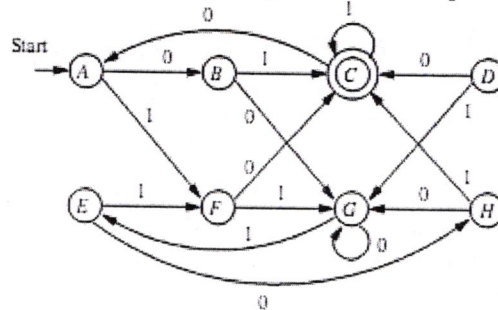
- 12 a) Give 6-tuple representation for Moor machine and Mealy machine. [5M]
- b) Construct the Moore machine which is equivalent to the following Mealy machine given in the table form [5M]

Present state	Next state			
	Input a = 0		Input a = 1	
	state	output	state	output
→q <sub>0</sub>	q <sub>2</sub>	0	q <sub>2</sub>	0
q <sub>1</sub>	q <sub>1</sub>	1	q <sub>4</sub>	0
q <sub>2</sub>	q <sub>2</sub>	1	q <sub>1</sub>	1
q <sub>3</sub>	q <sub>3</sub>	1	q <sub>5</sub>	0

- 13 a) Write the algebraic laws for regular expressions. [5M]  
 b) Define and explain pumping lemma for Regular Languages with an example. [5M]

OR

- 14 Construct Minimum state DFA for the following DFA with equivalent states [10M]



- 15 The following Context Free Grammar generates the language of regular expression  $0^*1(0+1)^*$

$$\begin{aligned} S &\rightarrow A1B \\ A &\rightarrow 0A \mid \epsilon \\ B &\rightarrow 0B \mid 1B \mid \epsilon \end{aligned}$$

Give the leftmost and rightmost derivations of the following strings

- a) 00101  
 b) 1001

[10M]

OR

- 16

Suppose the PDA  $P = (\{q, p\}, \{0, 1\}, \{Z_0, X\}, \delta, q, Z_0, \{p\})$  has the following transition functions

1.  $\delta(q, 0, Z_0) = \{(q, XZ_0)\}$ .
2.  $\delta(q, 0, X) = \{(q, XX)\}$ .
3.  $\delta(q, 1, X) = \{(q, X)\}$ .
4.  $\delta(q, \epsilon, X) = \{(p, \epsilon)\}$ .
5.  $\delta(p, \epsilon, X) = \{(p, \epsilon)\}$ .
6.  $\delta(p, 1, X) = \{(p, XX)\}$ .
7.  $\delta(p, 1, Z_0) = \{(p, \epsilon)\}$ .

Starting from the initial ID  $(q, w, Z_0)$ , show all the reachable ID's when the input  $w$  is:

- a) 01  
 b) 0011

[5M]  
 [5M]

17 For the following grammar

$$\begin{aligned} S &\rightarrow 0A0 \mid 1B1 \mid BB \\ A &\rightarrow C \\ B &\rightarrow S \mid A \\ C &\rightarrow S \mid \epsilon \end{aligned}$$

[10M]

- a) Eliminate  $\epsilon$ -productions.
- b) Eliminate any unit productions in the resulting grammar.
- c) Eliminate any useless symbols in the resulting grammar.
- d) Put the resulting grammar into Chomsky Normal Form.

OR

18 Explain about Turing machines and Computers.

[10M]

19 Explain Post's Corresponding Problem in detail.

[10M]

OR

20 a) Explain Polynomial time reductions.

[5M]

b) Write about satisfiability problem.

[5M]