

Registration Number:

Date 6-12-2022 ( 1 PM )

**ST. JOSEPH’S UNIVERSITY, BENGALURU -27**

**M.Sc (Computer Science) – I SEMESTER**

 **SEMESTER EXAMINATION: OCTOBER 2022**

**(Examination conducted in December 2022)**

**CS 7221: THEORY OF COMPUTATION**

**Time: 2 Hours Max Marks: 50**

**This paper contains 3 printed pages and 3 parts**

**PART-A**

**Answer all FIVE questions (1 X 5 = 5)**

1. Write the notations to represent Automata.
2. Construct a MOORE Machine that prints a string “a” whenever the sequence 01 is encountered on any input binary string.
3. Define Kleen closure.
4. Define Nullable variable.
5. Explain Final state Acceptance by PDA.

**PART- B**

**Answer any FIVE questions (3 X 5 = 15)**

1. Write the ∈ -Closure for all the states of the following ∈ -NFA.



1. Obtain a DFA to accept strings of 0's and 1's starting with at least two 0's and ending with at least two 1's.
2. Derive the string 0111 00 from the following grammar,

S → 0 S 1 S | 1 S 0 S | ∈

 and draw the parse tree.

1. What is an Ambiguous Grammar? Explain with an example.
2. Eliminate useless symbols from the following productions

S → aAa

A → Sb

A → bCC

A → DaA

C → abb

C → DD

E → aC

D → aDa

1. Reduce the following grammar G to CNF.

 S → a A D

 A → a B | b A B

 B → b

 D → d

1. Explain Turing Machine and Language acceptance of TM.

**PART- C**

**Answer any THREE questions (10 X 3 = 30)**

1. a. Convert the following NFA to DFA using Subset method. [7 Marks]



b. Define Extended transition function and check whether the string 000101 is accepted by the above DFA. [3 Marks]

1. a. Minimize the following DFA. [7 Marks]



b. Define GNF. [3 Marks]

1. a. Explain Chomsky hierarchy of generative grammars. [7 marks]
2. Prove that the following language is not regular. WWR Where W belongs to (a+b)\*.

 [3 Marks]

1. a. Obtain a PDA to accept the language L(M) = { w c wR | w ∈ (a + b)\* } where wR is the reverse of w. Check whether the string abcba is accepted by the PDA.

 [6 marks]

1. Construct an NFA with moves for the RE (a+b)\* cd [4 Marks]