Total No. of Questions: 05 Total No. of Printed Pages: 02

Roll No. _____

BTCS501N/ BTCS501

B.Tech./ B.Tech.+M.B.A./ B.Tech.+M.Tech.(CSE, IT, CSE-CF, CSE-BDA, CSE-BDCE, CSE-ES, CSE-MA, CSE-BDAI, CSE-CMCI, CSE-AII, CSE-DSI, CSE-FSDI)

V/VI Semester Examination, June-July 2024

Theory of Computation

Choice Based Credit System (CBCS)

Time: 3 Hrs. **Maximum Marks: 60**

Minimum Pass Marks: 24

Note: (1) All questions carry equal marks, out of which part 'A' and 'B' carry 3 marks and part 'C' carries 6 marks.

(2) From each question, part 'A' and 'B' are compulsory and part 'C' has an internal choice.

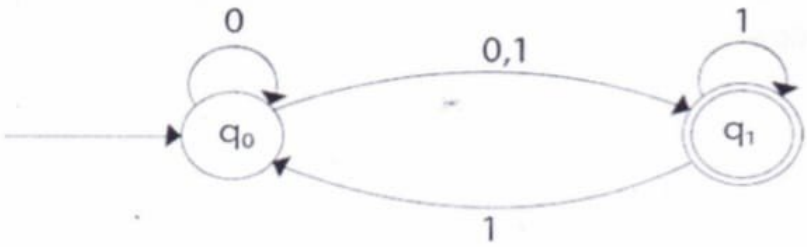
(3) Draw a neat diagram, wherever necessary.

(4) Assume suitable data wherever necessary.

Q.1(A) Differentiate between DFA & NFA with tuples and example. **03**

(B) Construct an NFA with $\sum = \{0, 1\}$ for the language $L = \{0^m1^n \mid m \geq 0 \text{ and } n \geq 1\}$. **03**

(C) Convert the given NFA into its equivalent DFA. **06**



OR

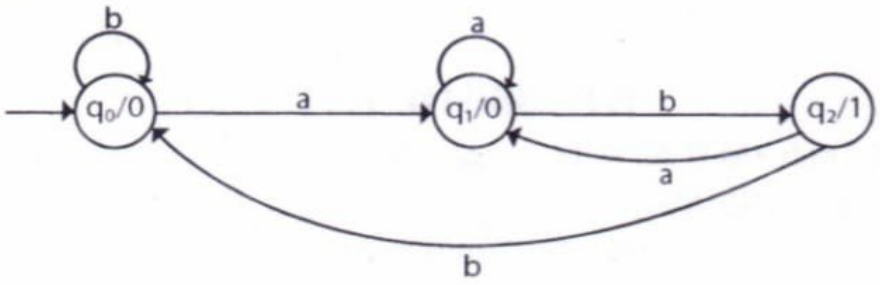
Construct a NFA accepting all string in {a,b} with either two consecutive a's or two consecutive b's, and convert to DFA Using Myhill-Nerode Theorem.

Q.2(A) What is Pumping Lemma for regular languages? Write Application of Pumping Lemma. **03**

(B) What are regular expressions? Write the regular expression for the language starting with a but not having consecutive b's. **03**

Contd.....

(C) Convert the given Moore machine into its equivalent Mealy machine. **06**



OR

Design the following -

I. Design a NFA from given regular expression 10 + (0 + 11)0* 1.

II. Design a NFA from given regular expression 1 (1* 01* 01*) *.

Q.3(A) How to generate a string from the grammar using leftmost derivation and right most derivation. Explain with suitable example. **03**

(B) Explain in brief Closure and Decision Properties of CFLs. **03**

(C) Describe Chomsky Normal Form and Greibach Normal Form with suitable example. **06**

OR

Generate a Chomsky Normal Form (CNF) for the following context free grammar (CFG).

S->aAa|bBb|e

A->C|a

B->C|b

C->CDE|e

D->A|B|ab

Q.4(A) Define Pushdown Automata. Also describe Instantaneous Description of PDA. **03**

(B) Explain pushdown automata acceptance by empty stack with suitable example. **03**

(C) Design a Pushdown Automata for the given language $L = \{ a^n b^{n+m} c^m \mid n, m \geq 1 \}$. **06**

OR

Design a Pushdown Automata for the given language $L = \{ a^n b^{2n} \mid n \geq 1 \}$.

Q.5(A) What is the difference between a recursive and recursively enumerable languages? **03**

(B) What is the halting problem of Turing machine and what do you mean by saying that the halting problem of TM is undecidable? **03**

(C) Design a Turing machine to the language $L = \{a^n b^n\}$ where $n \geq 1$. **06**

OR

Design a Turing machine which performs concatenation operation over two unary input strings.

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