GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–VI (OLD) EXAMINATION – WINTER 2020

Subject Code:160704   **Date:29/01/2021**
Subject Name:Theory Of Computation
Time:02:00 PM TO 04:00 PM   **Total Marks:56**

Instructions:
1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

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Q.1	**(a)**	Answer the following	**07**
		1.Define regular language and regular expressions.	
		2.Find regular expression for the following: Language of all string that do not end with 01.	
		3. Describe the language corresponding to following: $(1+01)*(0+01)*$	
	(b)	Answer the following:	
	1	Define One-to-one and Onto Functions. Also explain Compositions and Inverse of Functions.	**04**
	2	Define Mathematical Induction Principle and Prove that for every $n \geq 1$, $$\sum_{i=1}^{n} i^2 = n\,(n+1)(2n+1)\,/\,6$$	**03**

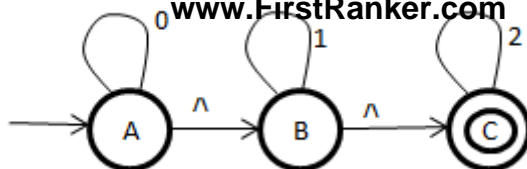|			
Q.2	**(a)**	Answer the following	**07**
		1.Draw FA for regular expression: $(111+100)*0$	
		2. Let M1 and M2 be the FA in fig below for the language L1 and L2, find L1 U L2 and L1 L2.	
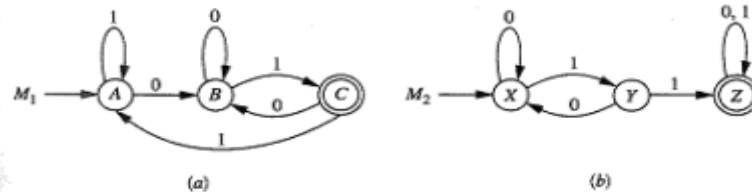
	(b)	For following NFA find minimum FA accepting same language	**07**
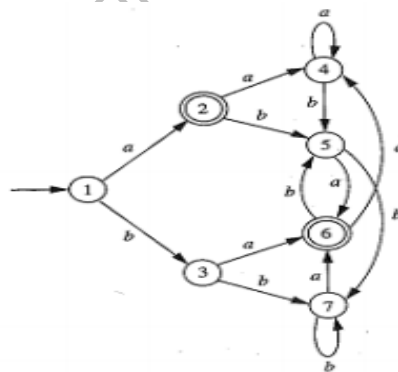
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Q.3	**(a)**	State the pumping lemma for regular language. Prove that $\{0^n 1^n \mid n >= 0\}$ is not a regular language	**07**
	(b)	Convert the Given NFA into its equivalent DFA-	

Q.4 **(a)** Give the context free grammar for the following languages.   **07**
1. L = { $a^n b^n$ | n>=0 }
2. Language for Palindroms.
3. Language for Non-Palindroms.
4. Language for Algebraic Expressions
5. L = { x belongs to {0,1}* | $n_o(x) = n_1(x)$ }
6. L = { x belongs to {0,1}* | $n_o(x) \neq n_1(x)$ }
7. The set of odd-length strings in {a,b}* with middle symbol a.

(b) Define NFA and NFA-Λ. Convert the following NFA to DFA   **07**
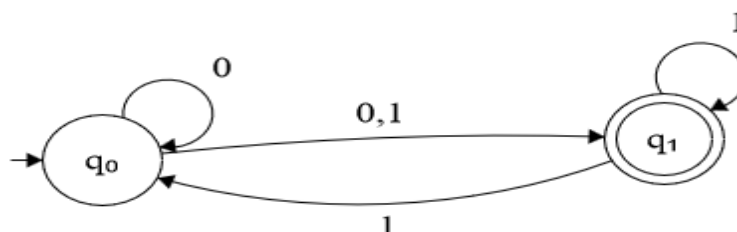
Q.5 **(a)** Differentiate Turing machine, PDA and FA with example.   **07**
(b) Write Short note on Universal Turing Machine.   **07**

Q.6 **(a)** Draw the PDA for the following language   **07**
L = { $a^i b^j c^k$ | i = j+k }
(b) Define CFG. Prove that the following CFG is Ambiguous.   **07**
S→S + S | S * S | (S) | a
Write the unambiguous CFG for the above grammar.

Q.7 **(a)** Define a Turing Machine. Design a Turing machine for deleting nth symbol from a   **07**
string w from the alphabet Σ = {0,1}.
(b) Prove that any Regular Language can be accepted by FA.   **07**

Q.8 **(a)** Draw Turing machine which accept palindrome language.   **07**
(b) Prove The Theorem: " If L1 and L2 are context – free languages, then the   **07**
languages $L1 \cup L2,\ L1L2, L1*$ are also CFL."

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