

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.

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: $(1+01)^*(0+01)^*$

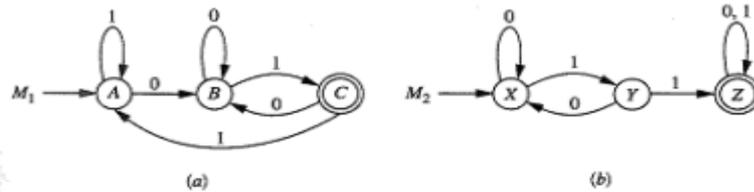
(b) Answer the following:

- 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 $n \geq 1$, **03**

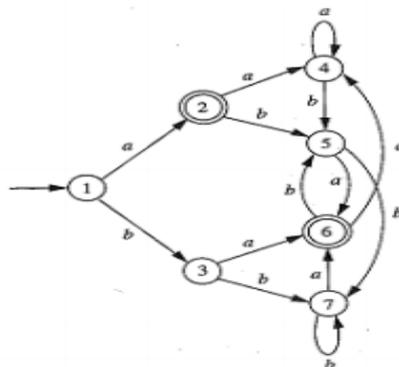
$$\sum_{i=1}^n i^2 = n(n+1)(2n+1) / 6$$

Q.2 (a) Answer the following **07**

1. Draw FA for regular expression: $(111+100)^*0$
2. Let M_1 and M_2 be the FA in fig below for the language L_1 and L_2 , find $L_1 \cup L_2$ and $L_1 \cap L_2$.

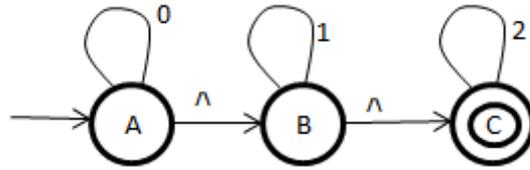


(b) For following NFA find minimum FA accepting same language **07**

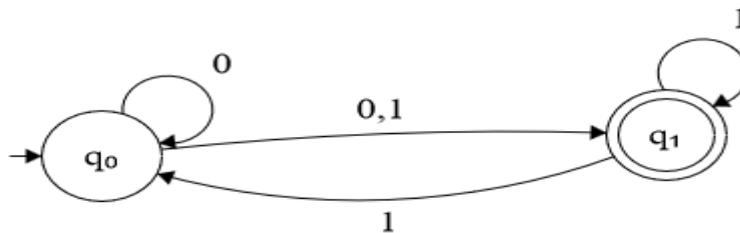


Q.3 (a) State the pumping lemma for regular language. Prove that $\{0^n 1^n \mid n \geq 0\}$ is not a regular language **07**

(b) Convert the Given NFA into its equivalent DFA-



- Q.4 (a)** Give the context free grammar for the following languages. **07**
1. $L = \{ a^n b^n \mid n \geq 0 \}$
 2. Language for Palindroms.
 3. Language for Non-Palindroms.
 4. Language for Algebraic Expressions
 5. $L = \{ x \text{ belongs to } \{0,1\}^* \mid n_0(x) = n_1(x) \}$
 6. $L = \{ x \text{ belongs to } \{0,1\}^* \mid n_0(x) \neq n_1(x) \}$
 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**
 $L = \{ a^i b^j c^k \mid i = j+k \}$
- (b)** Define CFG. Prove that the following CFG is Ambiguous. **07**
 $S \rightarrow S + S \mid S * S \mid (S) \mid a$
 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 string w from the alphabet $\Sigma = \{0,1\}$. **07**
- (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 L_1 and L_2 are context – free languages, then the languages $L_1 \cup L_2, L_1 L_2, L_1^*$ are also CFL.” **07**
