GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2017

Subject Code: 2160704 **Date:13/11/2017**

Subject Name:Theory of Computation

Time:02:30 PM TO 05:00PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
1. **Figures to the right indicate full marks.**

Q.1	**(a)**	Define one-to-one, onto and bijection function.	**03**
	(b)	Check whether the function f: $R^+ \rightarrow R$, $f(x) = x^2$ is one to one and onto.	**04**
	(c)	Explain equivalence relation with example.	**07**
Q.2	**(a)**	Write RE for the languages of all Strings that do not end with 01.	**03**
	(b)	Give recursive definitions of the extended transition functions, δ* for DFA and NFA.	**04**
	(c)	Using Principle of Mathematical Induction, prove that for every n >= 1 $\sum_{i=0}^{n} i = n(n+1)/2$	**07**
		OR	
	(c)	Prove that √2 is Irrational by method of Contradiction	**07**
Q.3	**(a)**	Compare FA, NFA and NFA-∧	**03**
	(b)	Draw a FA for following regular language. (i) (11+110)* 0 (ii) (0+1)*(10+11)	**04**
	(c)	Design a moore machine to determine residue number 3 for binary number.	**07**
		OR	
	(c)	Given the Context Free Grammar G, find a CFG G' in Chomsky Normal Form generating L(G) – { } $S \rightarrow aY \mid Ybb \mid Y$ $X \rightarrow \Lambda \mid a$ $Y \rightarrow aXY \mid bb \mid XXa$	**07**
Q.4	**(a)**	Define CFG. When is a CFG called an 'ambiguous CFG'?	**03**
	(b)	For the language L = { $xcx^r \mid x \in \{a,b\}^*$ } design a PDA(Push Down Automata).	**04**
	(c)	Write Kleene's Theorem part-I, Any regular language can be accepted by a finite automation	**07**
		OR	
	(c)	Convert following NFA- Λ to NFA	**07**

q	δ (q, Λ)	δ(q, 0)	δ(q, 1)
A	{B}	{A}	Ø
B	{D}	{C}	Ø
C	Ø	Ø	{B}
D	Ø	{D}	Ø

Q.5	**(a)**	Draw a Turing Machine(TM) to accept Even and odd Palindromes over {a,b}.	**07**
	(b)	Write a short note on Universal Turing Machine.	**07**
		OR	
Q.5	**(a)**	Write a Turing Machine to copy strings.	**07**
	(b)	Write a short note on μ-recursive function.	**07**

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