

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 $f: \mathbb{R}^+ \rightarrow \mathbb{R}$, $f(x) = x^2$ 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 $n \geq 1$ **07**

$$\sum_{i=0}^n i = n(n+1) / 2$$

OR

- (c) Prove that $\sqrt{2}$ is Irrational by method of Contradiction **07**

- Q.3** (a) Compare FA, NFA and NFA- \wedge **03**
 (b) Draw a FA for following regular language. **04**
 (i) $(11+110)^* 0$ (ii) $(0+1)^*(10+11)$
 (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 $L(G) - \{ \}$ **07**
 $S \rightarrow aY \mid Ybb \mid Y$
 $X \rightarrow \wedge \mid a$
 $Y \rightarrow aXY \mid bb \mid XXa$

- 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	$\delta(q, \Lambda)$	$\delta(q, 0)$	$\delta(q, 1)$
A	{B}	{A}	\emptyset
B	{D}	{C}	\emptyset
C	\emptyset	\emptyset	{B}
D	\emptyset	{D}	\emptyset

- 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**
