

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 160704

Date: 05/05/2017

Subject Name: Theory Of Computation

Time: 10:30 AM to 01:00 PM

Total Marks: 70

Instructions:

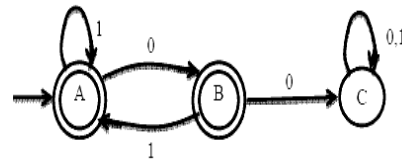
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain one-to-one, onto and bijection function with suitable example. **07**
(b) Explain equivalence relation with example. **07**
- Q.2** (a) Write Regular Expressions for the following languages of all strings in $\{0,1\}^*$ **07**
(i) Strings that do not end with 01.
(ii) The language of all strings containing both 101 and 010 as substrings
- (b) Using Principle of Mathematical Induction, prove that for every $n \geq 1$ **07**
$$\sum_{i=0}^n i = n(n+1) / 2$$

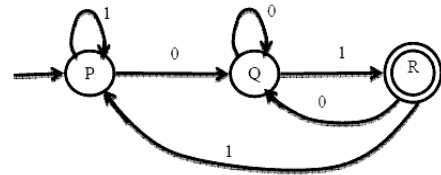
OR

- (b) Prove that $\sqrt{2}$ is Irrational by method of Contradiction. **07**
- Q.3** (a) Let M_1 and M_2 be the two FAs as given below. **07**

M1



M2



Draw FA recognizing $(L_1 \cup L_2)$ and $(L_1 - L_2)$ where L_1 and L_2 correspond to M_1 and M_2 respectively.

- (b) Compare FA, NFA and NFA- Λ . **07**

OR

- Q.3** (a) Given the Context Free Grammar G, find a CFG G' in Chomsky Normal Form generating $L(G) - \{ \}$ **07**
 $S \rightarrow aY \mid Ybb \mid Y$
 $X \rightarrow \wedge \mid a$
 $Y \rightarrow aXY \mid bb \mid XXa$
- (b) Draw a FA for following regular language. **07**
(i) $(11+110)^* 0$
(ii) $(0+1)^*(10+11)$

- Q.4** (a) For the language $L = \{ xcx^r \mid x \in \{a,b\}^* \}$ design a PDA(Push Down Automata) and trace it for string "abcba". **07**
(b) Write Kleene's Theorem part-I, Any regular language can be accepted by a finite automation. **07**

OR

- Q.4** (a) Write transition table for PDA recognizing following language: **07**
 $\{ a^i b^j c^k \mid j = i \text{ or } j = k \}$.

(b) 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 Palindromes over {a,b}. (Even as well as Odd Palindromes).

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
