Seat No.: _____ **Enrolment No._____**

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

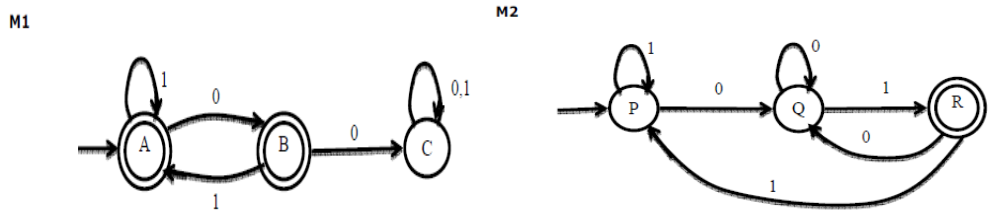
(b) Using Principle of Mathematical Induction, prove that for every n >= 1 **07**

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

OR

(b) Prove that √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**



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-∧. **07**

OR

Q.3 **(a)** Given the Context Free Grammar G, find a CFG G' in Chomsky Normal Form generating L(G) – { } **07**

S → aY | Ybb | Y

X → ∧ | a

Y → aXY | bb | 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 | x ∈ {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	δ (q, Λ)	δ(q, 0)	δ(q, 1)
A	{B}	{A}	Ó
B	{D}	{C}	Ó
C	Ó	Ó	{B}
D	Ó	{D}	Ó

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**

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