Seat No.: ________ Enrolment No. ________

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (OLD) EXAMINATION – WINTER 2018

Subject Code:160704 **Date: 30/11/2018**

Subject Name: Theory of Computation

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

Instructions:

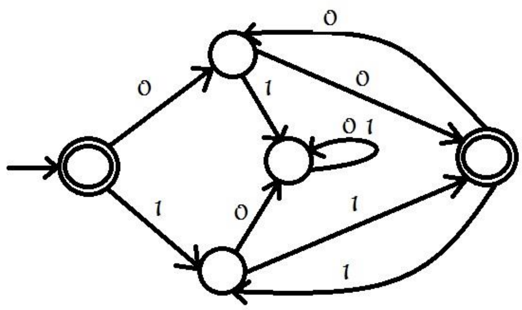
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** (1) State the properties of Equivalence Relations. **03**

(2) State the strong principle of mathematical induction and show how will you give proof by induction? **04**

(b) (1) Prove that the statements: (p v q) → r and (p → r) v (q → r) are logically equivalent. **03**

(2) What is the regular expression of following FA? **04**



Q.2 **(a)** Convert following NFA-Λ to NFA, draw the NFA. {E} ϵ A. **07**

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

(b) Draw NFA – Λ for ((0 + 1)*10 + (00)*(11)*)* **07**
Show step by step construction.

OR

(b) State part-1 and part-2 of Kleens theorem and show the proof. **07**

Q.3 **(a)** L1 and L2 are two languages: **07**

L1 = {x | 11 is not a substring of x}

L2 = {x | x starts with 0 and ends with 0}

Draw FA for both L1 and L2 and construct FA for L3 = L2 - L1\

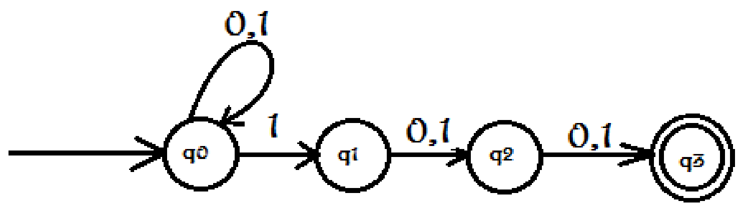
(b) An NFA with states 1-5 and input alphabet {a, b} has the following transition table. **07**

q	*∂(q,a)*	*∂(q,b)*
1	{1,2}	{1}
2	{3}	{3}
3	{4}	{4}
4	{5}	Ø
5	Ø	{5}

Q.1 Draw its transition diagram
Q.2 Calculate ∂ (1,a)*
Q.3 Calculate ∂ (1,aaabaab)*

OR

Q.3 **(a)** Convert this NFA to FA **07**



(b) A language L {a, b}* is defined as follows: **07**

1. a ϵ L
2. For any x ϵ L, ax ϵ L
3. For any x and y in L, all the strings bxy, xby and xyb are in L
4. No other strings are in L.

Prove that every element of L has more a's than b's.

Q.4 **(a)** Define PDA and give PDA to accept strings of palindrome. Show trace on the string *baab* **07**

(b) Write a short note on parsing. **07**

OR

Q.4 **(a)** Define deterministic pushdown automata. Construct an example of DPDA that accepts strings with more a's than b's **07**

(b) (1) Give recursive definition for Language Pal of palindromes. **03**

(2) Give CFG equivalent to regular expression $(011 + 1)^* (01)^*$ **04**

Q.5 **(a)** Define Turing Machine and draw a TM to accept $\{a,b\}^*\{aba\}\{a,b\}^*$ **07**

(b) Write a short note on Universal Turing Machines. **07**

OR

Q.5 **(a)** Write a note on models of computation and The Church Turing Thesis. **07**

(b) What is the difference between accepting a language and recognizing a language? Write short note on recursively enumerable languages. **07**

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