

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:160704

Date: 30/11/2018

Subject Name: Theory of Computation

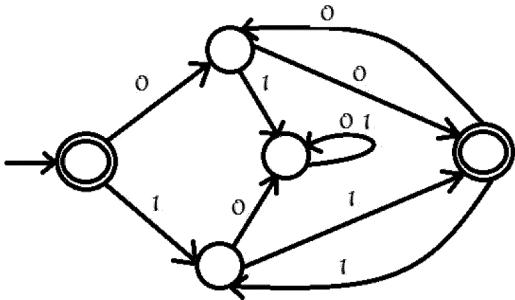
Time: 02:30 PM TO 05:00 PM

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: $(p \vee q) \rightarrow r$ and $(p \rightarrow r) \vee (q \rightarrow r)$ 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. $\{E\} \in A$. **07**

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

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

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	$\delta(q,a)$	$\delta(q,b)$
1	{1,2}	{1}
2	{3}	{3}
3	{4}	{4}
4	{5}	$\emptyset$
5	$\emptyset$	{5}

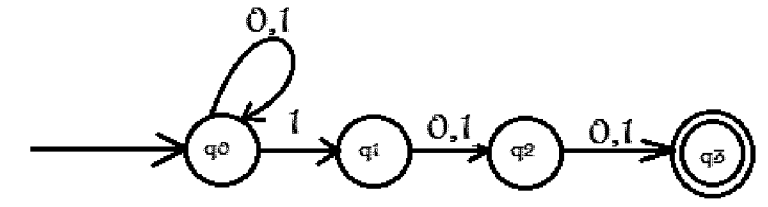
Q.1 Draw its transition diagram

Q.2 Calculate $\delta^*(1,a)$

Q.3 Calculate $\delta^*(1,aaabaab)$

OR

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



- (b) A language $L \{a, b\}^*$ is defined as follows: 07
1. $a \in L$
 2. For any $x \in L$, $ax \in L$
 3. For any x and y in L , all the strings bxy , xyb 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? 07
- Write short note on recursively enumerable languages.
