Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:2160704 **Date:27/11/2018**

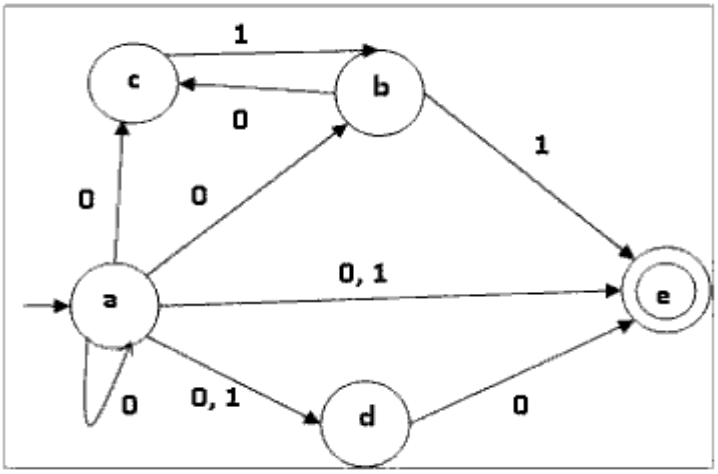
Subject Name:Theory of Computation

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.**

			MARKS
Q.1	**(a)**	Define one-to-one, onto and bijection function.	**03**
	(b)	Explain reflexivity, symmetry, and transitivity properties of relations.	**04**
	(c)	State the principle of mathematical induction and prove by mathematical induction that for all positive integers n 1+2+3+……..+n = n (n+1)/2.	**07**
Q.2	**(a)**	What are the closure properties of regular languages?	**03**
	(b)	Explain moore machine and mealy machine.	**04**
	(c)	What are the applications of finite automata? Draw Finite Automata to accept following. (i) the language accepting strings ending with ’01’ over input alphabets Σ = {0, 1} (ii) the language accepting strings ending with ‘abba’ over input alphabets Σ = {a, b}	**07**
		OR	
	(c)	Define NFA-Λ. Explain how to convert NFA-Λ into NFA and FA with suitable example.	**07**
Q.3	**(a)**	State pumping lemma for regular languages.	**03**
	(b)	Explain Union Rule and Concatenation Rule for Context Free Grammar.	**04**
	(c)	Write difference between DFA and NDFA. Convert the following NDFA to DFA.	**07**



OR

Q.3	**(a)**	Define Context-Sensitive Grammar. What is the language of following context-sensitive grammar? $S \rightarrow aTb \mid ab$ $aT \rightarrow aaTb \mid ac.$	**03**
	(b)	Find a regular expression corresponding to each of the following subsets of {0, 1}* (i) The language of all strings that begin or end with 00 or 11.	**04**

(ii) The language of all strings beginning with 1 and ending with 0.

(c) What is CNF? Convert the following CFG into CNF. **07**

$S \rightarrow ASA \mid aB,$

$A \rightarrow B \mid S,$

$B \rightarrow b \mid \varepsilon$

Q.4 **(a)** What is Turing Machine? Write advantages of TM over FSM. **03**

(b) Define CFG. When a CFG is called an 'ambiguous CFG'? **04**

(c) Define PDA. Describe the pushdown automata for language $\{0^n1^n \mid n \geq 0\}$. **07**

OR

Q.4 **(a)** Write a short note on Universal Turing Machine. **03**

(b) Describe recursive languages and recursively enumerable languages. **04**

(c) Explain push down automata with example and their application in detail. **07**

Q.5 **(a)** Define grammar and chomsky hierarchy. **03**

(b) What are the applications of regular expressions and finite automata? **04**

(c) Draw a transition diagram for a Turing machine for the language of all palindromes over {a, b}. **07**

OR

Q.5 **(a)** Compare FA, NFA and NFA-^. **03**

(b) Write a short note on church-turing thesis. **04**

(c) Explain primitive recursive function by suitable example. **07**

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