

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:2160704

Date:27/11/2018

Subject Name:Theory of Computation

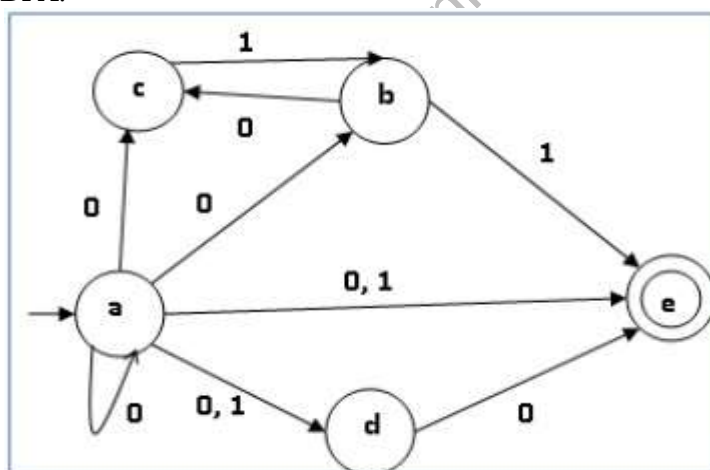
Time: 02:30 PM TO 05:00 PM

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 $1+2+3+\dots+n = n(n+1)/2$.	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.	07
	(i) the language accepting strings ending with '01' over input alphabets $\Sigma = \{0, 1\}$	
	(ii) the language accepting strings ending with 'abba' over input alphabets $\Sigma = \{a, b\}$	
	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



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

- (ii) The language of all strings beginning with 1 and ending with 0. **07**
- (c) What is CNF? Convert the following CFG into CNF. **07**
 $S \rightarrow ASA \mid aB,$
 $A \rightarrow B \mid S,$
 $B \rightarrow b \mid \epsilon$
- 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 $\{0^n 1^n \mid n \geq 0\}$. **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- Λ . **03**
 (b) Write a short note on church-turing thesis. **04**
 (c) Explain primitive recursive function by suitable example. **07**

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