

Term End Examination - November 2014

Course : ITE203 - Theory of Computation Slot : E2+TE2

Class NBR : 6148

Time : Three Hours Max.Marks:100

PART - A (8 X 5 = 40 Marks) Answer <u>ALL</u> Questions

- 1. Design a non-deterministic finite automata for the set of strings $\Sigma = \{0,1\}$ such that fourth symbol from right end is 1.
- 2. Construct a non-deterministic finite automata for the following left linear grammar $S \rightarrow A0 \mid B1, \quad A \rightarrow A0 \mid 0, \quad B \rightarrow B1 \mid 1$
- 3. a) Give a context free grammar for the language containing all the strings of different [2.5] first and last symbols over $\Sigma = \{0,1\}$
 - b) Give a context free grammar for the regular expression $(011 + 1)^* (01)^*$
- 4. Let the language be the occurrence of a particular character is determined by the perfect square result of the given number n, the bound for n starts from 4. Check whether the given language is regular or not using pumping lemma.
- 5. Prove that following context free grammar is ambiguous.

$$S \rightarrow iCtS \mid iCtSeS \mid a$$

 $C \rightarrow b$

Also draw derivation tree.

- 6. List out various types of Turing machines. Briefly explain about the role of transitions in non-deterministic Turing Machines.
- 7. What do you mean by push down automata? State the condition which states the given automata is deterministic.
- 8. Discuss briefly about the Chomsky hierarchy of classifications.

PART - B (6 X 10 = 60 Marks)

Answer any SIX Questions

9. Minimize the following transition table of deterministic finite automata

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State	а	b
$\rightarrow q_0$	91	q_2
q_1	q_4	q_3
q_2	q_4	q_3
q ₂ q ₃	q_5	q_6
$\overline{q_4}$	q_7	q_{6}
$\overset{\smile}{q_5}$	q_3 .	q_6
q_6	$q_{\scriptscriptstyle extsf{f heta}}$	q_6
q_7	q_4	q_6

10. Apply Arden's theorem to construct the regular expression from the following equations of a transition system.

$$A = B0 + C1 + ^{\wedge}$$

$$B = A0 + C0$$

$$C = A1 + B1$$

Where A is initial state

B, C are final states.

11. Consider the following language

$$L_3 = \{a^m b^m c^n \mid m, n \ge 1\} \cup \{a^m b^n c^n \mid m, n \ge 1\}$$

- a) Find the productions for the above language in view with Context Free Grammar. [4]
- b) Check all the obtained productions are in Chomsky Normal Form. Otherwise convert to Chomsky Normal Form. [6]
- 12. Convert the following Context Free Grammar to Greibach Normal Form

 $S \rightarrow ABA$

$$A \rightarrow aA \mid ^$$

$$B \rightarrow bB \mid ^{\wedge}$$

13.	Design a Push down automata which accepts $L = \{ a^3b^nc^n \mid n \ge 0 \}$. Check the acceptance of string by both null stack method and final state method.	
14.	Design a Turing Machine to accept the strings formed with zero and one and having the substring 000.	
15.	Differentiate the following	
	a) Deterministic finite automata and Non-deterministic finite automata	[2.5]
	b) Regular expression and regular language	[2.5]
	c) Regular sets and non-regular sets	[2.5]
	d) Deterministic push down automata and Non deterministic push down automata.	[2.5]
16.	Write short notes on	
	a) Halting problem of Turing Machine	[5]
	b) Computable functions.	[5]

