



DOON UNIVERSITY, DEHRADUN
End Semester Examination, 2015-16
School of Technology

MCA Integrated (Sem. IV)
Course: STM-524: Theory of Computation

Time: 3 Hrs.

Marks: 50

Section A

Answer any 5

[2×5=10 Marks]

1. Give an example of context sensitive grammar.
2. What is the difference between an LBA and TM? Answer in one sentence.
3. What does the regular expression $r=(a+b)a^*b^*(a+b)$ represent? Write corresponding language in words.
4. Define the term ambiguity in any grammar.
5. What is the utility of pumping lemma for regular languages?
6. Draw the state diagram for a finite automaton accepting the strings of 0's having length in multiple of 3.
7. Write down the difference between Mealy and Moore machine in one statement.
8. Write Arden's theorem using proper notations.

Section B

Answer any 4

[5×4=20 Marks]

9. What is pumping lemma for context free languages? Explain with proper notations.
10. Define a LBA with appropriate notations.
11. Generate a parse tree for the yield $ababab$ from following production rules:
 $S \rightarrow aAb, \quad A \rightarrow bSa|B, \quad B \rightarrow \lambda$
12. Prove that the language $L=\{a^p \mid p \text{ is a prime number}\}$ is not regular.

(P.T.O.)

13. Construct a DFA for following transition function (q_0 is initial state and q_2 is the final state):

	a	b
$\rightarrow q_0$	q_0, q_1	q_2
q_1	q_1, q_2	q_2
(q_2)	q_2	q_2

14. What is a grammar? Define with the help of an example using proper notations.

Section C

Answer any 2

[10×2=20 Marks]

15. Design a PDA to accept the language $L = \{w \mid w \text{ is a string defined on } \Sigma = \{a, b, x, y, z\} \text{ and has the form } a^n x y^k z b^n\}$. Describe the complete notations of designed PDA.

16. Design a PDA for following grammar

$$S \rightarrow aSb \mid \lambda$$

Use empty store to accept the strings.

17. Design a TM to find the next number of a given binary number with full description of the machine.

18. Write short notes on the following:

a. PCP with an example

[4 Marks]

b. Halting problem of TM

[3 Marks]

c. N and NP class of problems

[3 Marks]

(End of the Paper)