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**University Examinations 2014/2015**

THIRD YEAR, SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER TECHNOLOGY.

**CIC 3375: AUTOMATA THEORY.**

**DATE: AUGUST 2015 TIME: 2 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Give a reason why studying automata theory is important. (2 marks)
2. Given the following 

productions:



Trace the execution of applying rule 1 three times and rule 2 once (5 marks)

1. Discuss context sensitive grammars and context free grammars (4 marks)
2. Give an application of context free grammars (4 marks)
3. Give the explanation of this Turing Machine transition function  (5 marks)
4. Convert the dfa to DFA showing all the steps (10 marks)

**QUESTION TWO (20 MARKS)**

1. Write a regular expression for the following; (6 marks)
2. The set of strings over that end in 3 consecutive 1’s.
3. The set of strings over that have at least one 1.
4. The set of strings over that have at most one 1.
5. Explain what is meant by a regular language (2 marks)

Let N1 be a Nondeterministic Finite automaton. Give its formal description including its transition function. (10 marks)

1. What an accepting or rejecting state of a finite automata (2 marks)

**QUESTION THREE (20 MARKS)**

1. Define the following terms and give an example of each (6 marks)
2. Alphabets
3. String
4. Words
5. Give a regular expression for the machine shown below (4 marks)
6. What is decidability and undecidability of problems? (4 marks)
7. What the Turing test (2 marks)
8. Draw a transition table of the DFA below (4 marks)

**QUESTION FOUR (20 MARKS)**

1. Draw Chomsky hierarchy showing all the four classes (3 marks)
2. Compare deterministic finite automata with non deterministic finite automata (6 marks)
3. Discuss two ways of accepting an input string by pushdown automata (4 marks)
4. Discuss the following (4 marks)
5. Configuration of a turing machine
6. Acceptance by a turing machine
7. Discuss church turing thesis (3 marks)

**QUESTION FIVE (20 MARKS)**

1. Find a PDA for each of the following languages (10 marks)
2. 
3. All strings over with the same number of *as* and *bs*
4. Using suitable differentiate between leftmost and rightmost derivations as used in context free grammars. (6 marks)
5. You have been contacted to give a lecture on context free grammars and programming languages. Briefly discuss the key point you would include in your decision. (4 marks)