THE OPEN UNIVERSITY OF SRI LANKA
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
BACHELOR OF SCIENCE DEGREE PROGRAMME – Level 05
FINAL EXAMINATION 2015/2016
CPU3144 - THEORY OF COMPUTING
DURATION: TWO HOURS ONLY (2 HOURS)

DATE: 07.01.2017 **TIME: 01.30 pm - 03.30pm**

ANSWER FOUR QUESTIONS ONLY.

01.

I. What is Determinism and Non determinism? What are the differences between them?

II. Consider the Deterministic Finite Automata M= $(\{q_0,q_1,q_2\},\{0,1\},\delta,q_0,\{q_2\})$ where δ is given by

$\delta(q_0, 0) = q_0$ $\delta(q_0, 1) = q_1$
$\delta(q_1, 0) = q_0$ $\delta(q_1, 1) = q_2$
$\delta(q_2, 0) = q_2$ $\delta(q_2, 1) = q_1$

represent the above details in a transition graph.

III. If δ^* is the extended transition function, write the three conditions that should satisfied by δ^*.

IV. Use the three conditions that you gave in partIII to check whether the string 101 is accepted by the machine M.

02. I. Define the following terms with an example for each.

a) String
b) Alphabet
c) Power set
d) Language
e) Null string

II. What is the difference between a string and a word of a language?

III. Write the difference between an alphabet and an element of a set.

VI. For each of the following conditions find all the strings x over the alphabet

$\sum = \{a, b\}$

a) No symbol is repeated in x.
b) The length of x is 3.

03.

I. Explain Chomsky Hierarchy in brief.

II. In derivation of grammars what is meant by sentential form and the sentence?

III. The grammar G is defined as $V_n = \{S,B,C\}$ and $V_t = \{a,b,c\}$ where V_n and V_t are non-terminals and terminals . S is the start symbol and P consists of

a) $S \rightarrow aBC$
b) $S \rightarrow aSBC$
c) $aB \rightarrow ab$
d) $bB \rightarrow bb$
e) $CB \rightarrow BC$
f) $bC \rightarrow bc$
g) $cC \rightarrow cc$

Find one derivation for **aaabbbccc.**

04.

I. Define Regular Expression and Regular Language and show that the language $\mathbf{L = \{a\omega a: \omega \in \{a, b\}^*\}}$ is regular.

II. How can you create a regular expression for a particular language?

III. Write the corresponding finite automata for the regular expression **aa((a+b)(a+b))*.**

VI. Give the difference between context free languages and regular languages.

05.

I. What is meant by a Finite State Machine (FSM)?

II. Give two names of FSM and explain their functionalities.

III. Write three types of automata that you have studied under the course Theory of Computing.

06.

I. What do you understand by the term **"abstract"** in the abstract machine?

II. Give two examples from your day to day life where abstract machines are used, with explanation of how these are being used.

III. Show a derivation tree for the string aabbb with the grammar
$S \rightarrow AB / \lambda$
$A \rightarrow aB$
$B \rightarrow Sb$

IV. Give a brief description of the language generated by grammar in part III.