The Open University of Sri Lanka
B.Sc. Degree Programme –Level 05
Department of Computer Science
Final Examination -2016/2017
CPU3144: Theory of Computing
Duration Two hours

Date: 04th January 2018	**Time: 1.30pm-3.30pm**

Answer Four Questions only

01. (i) Define Automation.

(ii) Give the formal definition of a Deterministic Finite Automation (DFA).

(iii)When does a DFA accepts a string?

(iv)What are the differences between a Non-Deterministic Finite Automation (NFA) and a DFA?

02.(i) Write the definition of a substring, a prefix and a suffix of a string.

(ii) Write down the set of substrings, set of prefixes and the set of suffixes of the string ***bbrdvbrk*** over the alphabet {a,…,z}.

(iii) What is the condition that a prefix is said to be a proper prefix and a suffix to be a proper suffix.

(iv)Write down three substrings that are not substrings of ***bbrdvbrk.***

03. (i) What is meant by Chomsky hierarchy of grammars?

(ii) Write the names of the Chomsky hierarchy of grammars.

(iii) Using your answer to part (ii) name the grammar type given below.

$G=<N, \sum \quad P, S>$

$N=\{S\}$

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

$P=\{S\rightarrow aSb\ ,\ S\rightarrow \varepsilon\ \}$

(iv) Given a Grammar $G=(\{s\},\{a,b\},S,P)$ with P *defines* $S\rightarrow aSb$

$S\rightarrow \varepsilon$

Obtain a sentence in the language generated by G and the sentential form.

04. (i) What is a Regular Expression and a Regular Language?

(ii) A language is a set of strings over an alphabet. What are the conditions this set has to satisfy for the language to be regular.

(iii) Write the corresponding regular languages for the Regular Expressions given below.

(a) (a^*+bc)

(b) $(a+b)^*$

(c) a^*b^*

(d) $a^*(b+cc)$

(iv) *Let* $\sum = \{a,b\}$, write the regular expression for the following sets.

(a) All strings in $\sum^*$with number of a's divisible by four.

(b) All strings in $\sum^*$with exactly one occurrence of the substring aaaa.

05. State with justification, whether each of the following statements is true or false.

(i) $\{a^m b^{2n} |$ m≥0 and n≥0 $\}$ is regular.

(ii) Any finite subset of $\{ab\}^*$ is a regular language.

(iii) If L_1={∈,0,1} and L_2= {01,11}.Then their composition is :
L_1L_2 ={01,11,001,011,101,111}

(iv) No infinite subset of $\{a^n b^n |$ n≥0$\}$is regular.

06. (i) Define the following terms with an example for each.

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

(ii) What is the difference between a string and a word of a language ?

(iii) What is 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∑={a,b}

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