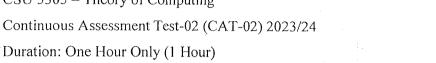The Open University of Sri Lanka

B.Sc. Degree Programme – Level 05

Department of Computer Science

CSU 5305 – Theory of Computing

Continuous Assessment Test-02 (CAT-02) 2023/24

Duration: One Hour Only (1 Hour)

Date: 03.02.2024   Time: 9.00 a.m. – 10.00 a.m.

Answer All Questions.

(01) **(i)** What is meant by derivation in Theory of Computing?

(ii) Name the two types of derivations in Theory of Computing.

(iii) What is the main difference between the **Sentential form** and the **Sentence** of a string?

(iv) Suppose the grammar G is given by

$G < \{S\}, \{a, b\}, P, S >$ where P is

$S \longrightarrow aSb$

$S \longrightarrow \varepsilon$

Derive the string *aaabbb*

(v) For the string *aaabbb*, write the sentence and the sentential forms.

(vi) What is meant by a derivation tree?

(vii) Give another name for the derivation tree.

(viii) Draw a derivation tree for the string that you derived in **(01) part (iv).**

(ix) One way of representing a transition system is the transition function form. Write the names of other two forms of transition systems.

(x) Consider the transition system that has states q_1, q_2 & q_3 . with inputs $\{0,1\}$

The transition function is given below.

$$\delta(q_1, 0) \rightarrow q_1 \qquad \delta(q_2, 1) \rightarrow q_2$$

$$\delta(q_1, 1) \rightarrow q_2 \qquad \delta(q_3, 0) \rightarrow q_2$$

$$\delta(q_2, 0) \rightarrow q_3 \qquad \delta(q_3, 1) \rightarrow q_2$$

Using the above information, draw the other two transition systems, that you have given as answer to **(01) part (ix)**.

(50 marks)

(02) (i) Write the <u>names</u> of the four grammar types in Chomsky Hierarchy of Grammars.

(ii) Give the pictorial representation of Chomsky Hierarchy of Grammars.

(iii) Give the names of the most restricted and most flexible grammars in Chomsky Hierarchy of Grammars.

(iv) For the most restricted grammar in Chomsky Hierarchy of Grammars, write the names of two types of production rules.

(v) Give any two examples of production rules, for the names that you gave as answer to **(02) part(iv)**.

(50 marks)