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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) 2024/25
Duration: One Hour Only (1 Hour)

Date: 21.03.2025 **Time: 9.00 am-10.00 am**

Reg. Number:

Important Instructions

- This paper has 25 questions on 05 pages.
- Answer all the questions.
- From question (01) – (20) write your answers on the space provided on this question paper and (21)-(25), underline the correct answer on the question paper.
- **No extra sheets will be provided.**
- Questions appear on both sides of the paper.
- Last page (page 06) can be used as for rough work.
- Each question is allocated (04) marks.

To be completed by the examiner:

Number of correct answers	
Total marks	
%	

(01) Write the Chomsky Hierarchy of Grammars including the order and the relevant name in the ascending order.

Order	Relevant Name

(02) When constructing a derivation tree for a given word in the language with the set of grammatical rules, what is represented by the root of the tree?

(03) Construct the derivation for the string a+(a*a) with the grammar rules given below.
(Do not draw a derivation tree)

1) S → S+S
2) S → S*S
3) S → (S)
4) S → a

(04) Give another name for a derivation tree.

(05) Give the definition of a State Transition System (STS).

(06) How many transition systems have you studied under the course CSU 5305-Theory of Computing?

(07) Give the names of the transition systems as you mentioned in question (06).

(08) A transition system is given below. Give a name to the transition system.

	0	1
α	β	α
β	α	γ
γ	β	β

(09) Regarding the diagram given in question (08) what are represented by rows and columns?

(10) There are four essential features of any computing device. Give the names of the four features on the space provided below.

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-
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(11) Considering the operation of an automatic door what are the two possible states?

1)

2)

And what are the four input conditions?

1) 2) 3) 4)

(12) What do you mean by a power of a machine? **(Explain with one or two sentences)**

(13) Draw the pictorial representation of the memory of a computing device.

(14) Give the definition of a string and complement of a string.
(**Warning:** When giving the definition do not take an example to explain the definition. If you do so, **NO MARKS WILL BE GIVEN**)

(15) For any language L, write the operations given below.

a) $L - \phi = ?$
b) $\phi - L = ?$
c) $\phi L = ?$
d) $\{\varepsilon\}\ L = ?$

(16) If L is a language what is denoted by L^+ ? Give a name for L^+.

(17) Are both the operations given below correct or not. (Do not give any justification)

$\phi^* = \{ \varepsilon \}$ .....

$\{ \varepsilon \}^* = \{ \varepsilon \}$ .....

(18) Write the languages of the regular expressions given below.

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

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

(19) Write all strings over {0,1}, that do not contain 01.

(20) A grammar is given as
<terminals: a,b ; Non terminals : S; production rules: S → aS, S → bS, S → a, S – b>.
Write the production rules in a more compact notation.

(21) Finite State Machine is _____ tuple machine.

a) 4 b) 5 c) 6 d) Unlimited

(22) Transition function of a machine maps to

a) $\sum x Q \rightarrow \sum$ b) $Q x Q \rightarrow \sum$ c) $\sum x \sum \rightarrow Q$ d) $Q x \sum \rightarrow Q$

(23) An automation is made up of

a) States b) Transitions c) Both d) None of the above answers

(24) In the theory of automation, how do you represent states?

a) by Squares b) by Arcs c) by Circles d) by Arrows

(25) _____ is a finite collection of symbols from the alphabet.

a) Switch b) String c) State d) Letters