The Open University of Sri Lanka
B.Sc. Degree Programme- Level 05
Department of Computer Science
CSU 5305- Theory of Computing
Continuous Assessment Test-01 (CAT 01) 2024/25
Duration: One Hour Only (1 Hour)

2 3 FEB 2025

Date: 23.02.2025   Time: 2.30 pm-3.30pm

Reg. Number: [   ]

Important Instructions
- This paper has 25 questions on 05 pages.
- Answer all 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) How many main streams covered by the course material CSU5305-Theory of Computing?

(02) Write the names of the main streams in the space provided.

(03) What is the definition of an Alphabet regarding to Theory of Computing?

(04) Write the symbol denoted by any alphabet.

(05) Write the symbol denoted by all strings over an alphabet.

(06) A Context Free Grammar (CFG) is a 4 tuple. Write G= {? ? ? ?}. Give the symbols denoted by the question marks(?).

(07) A language L is a Context Free Language (CFL). If there is a Context Free Grammar (CFG) G, using functional notation write L with respect to G.

(08) The language $\{a^k ba^k \mid$ for $k \geq 1\}$. Write the first five strings over the alphabet $\{a,b\}$.

(09) In a CFL what letter is denoted for the finite set of rules?

(10) Write three strings of CFG which generates palindrome for binary numbers (0,1).

(11) The language generated by the grammar is given below.

S:=aSa
S:=bSa
S:=c
S:=d

Write five strings of length ≤ 5.

(12) Is the start symbol of a CFL belongs to terminals or non-terminals?

(13) If S and T are the sets of strings write the concatenation of the two sets in set notations.

(14) If A be any language. Write the **Kleene closure** of A.

(15) 01001 is a string over the alphabet {A,B,...,Z}.
Is the above statement true or false? **(Do not write any justification)**

(16) What is the language of the regular expression given by ((ab)*).

(17)   What is a Regular language?

(18)   G < {{s}, {a,b}, P, S} where P is given by:
        S→aSb
        S→ε
       Derive the string: aaabbb.

(19)   For the answer to question (18) write the <u>sentential form</u> and the <u>sentence</u>.

(20)   In derivations what is meant by Leftmost and Rightmost derivations?

(21)   Which one of these regular expression **isn't** equivalent to the regular expression:
       (m+n+o)*

       a) (m*n*+ o*)*
       b) ((mn)* + o*)*
       c) (m*n*o*)*
       d) (m*+n*+o*)*

(22)   Which of these is a regular set?

        i. $\{a^n b^{2m} \mid n \geq 0, m \geq 0\}$
        ii. $\{a^n b^m \mid n=2m\}$
        iii. $\{a^n b^m \mid n \neq m\}$
        iv. $\{x \in y \mid x, y \in \{a,b\}^*\}$

       a) (i)
       b) (iv)
       c) (i) and (iii)
       d) (i) and (iv)

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(23)   A string is denoted by:

a) w
b) A
c) G
d) S

(24)   A string with zero occurrences of symbols is known as an

a) Unfilled string
b) End string
c) Empty string
d) Empty set

(25)   According to Chomsky's hierarchy which of the following represents unrestricted grammar?

a) Type 3
b) Type 1
c) Type 2
d) Type 0