Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – MAY 2025

Date: 27-05-2025 **Time:** 09:30 am – 12:30 pm

School: SOCSE	**Program:** B Tech	
Course Code: CSE2018	**Course Name:** Theory of Computation	
Semester: VI	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**
Marks	**26**	**26**	**24**	**24**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

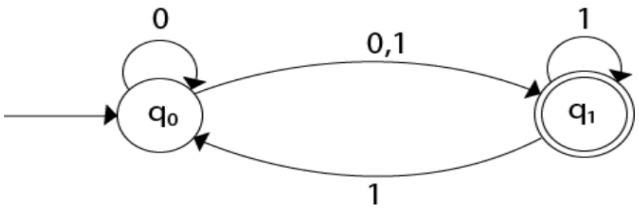
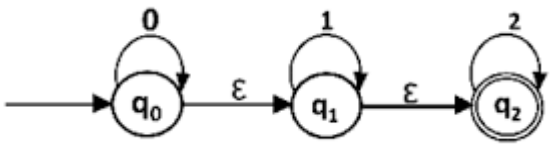
Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	Explain hierarchy of Automata in terms of representation power	**2 Marks**	**L2**	**CO1**
2.	Define language with an example.	**2 Marks**	**L2**	**CO1**
3.	Explain reversal and length of the string with example	**2 Marks**	**L2**	**CO1**
4.	State pumping lemma theorem for regular languages	**2 Marks**	**L2**	**CO2**
5.	Define Context Free Grammar with example	**2 Marks**	**L2**	**CO2**
6.	Differentiate NFA and DFA	**2 Marks**	**L2**	**CO2**
7.	Define left recursion in grammar the suitable example	**2 Marks**	**L2**	**CO3**
8.	Define Leftmost derivation and rightmost derivation	**2 Marks**	**L2**	**CO3**
9.	Differentiate Turing machine and PDA	**2 Marks**	**L2**	**CO4**
10.	Explain the 7 tuples of Turing machine	**2 Marks**	**L2**	**CO4**

Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	Let L1= {a, b, ab} L2= {00, 11} and L3= {x, xy, yx}, Find the following operations. 1. Concatenation of L1L2. 2. L2 $L2^R$ 3. $L3^*$ 4. $L2^+$ 5. $L3^3$	**10 Marks**	**L3**	**CO 1**
	b.	List out the applications of 1. Finite Automata 2. Pushdown Automata 3. Turing Machine	**10 Marks**	**L2**	**CO 1**
		Or			
12.	**a.**	Let $L=\{a,b\}^2$ and $M=\{0,1\}^2$. Generate the language X Such that string in $X=\{w/w \in LM\}$, show any three operations possible on the resultant language.	**10 Marks**	**L2**	**CO 1**
	b.	Explain about the following with examples. 1) Alphabet 2) Strings 3) Empty Strings 4) Length of the string 5) Concatenation of two strings	**10 Marks**	**L2**	**CO 1**

13.	**a.**	Convert the Regular Expression (b + (ab))* a into NFA with ε using Thompson's rule.	**10 Marks**	**L3**	**CO 2**
	b.	Construct DFA to accept the strings with a's and b's such that the string end with 'aab'.	**10 Marks**	**L3**	**CO 2**
		Or			
14.	**a.**	Convert the given NFA into its equivalent DFA. 	**10 Marks**	**L3**	**CO 2**
	b.	Convert the given NFA into its equivalent DFA. 	**10 Marks**	**L3**	**CO 2**

15.	**a.**	Consider the following grammar, S -> aB | bA A -> aS | bAA | a	**10 Marks**	**L3**	**CO 3**

		B -> bS | aBB | b Find the Left most Derivation, Right most Derivation and Parse Tree for the string aabbabba.			
	b.	Minimize the given grammer S → ASB A → aAS | a | ε B → SbS | A | bb	10 Marks	**L3**	**CO 3**
		Or			
16.	**a.**	Consider the following grammar, E-> E+T | T T-> T * F | F F-> (E) | id Find the Left most Derivation, Right most Derivation and Parse Tree for the string id + (id * id).	**10 Marks**	**L3**	**CO 3**
	b.	Prove using pumping Lemma that L={$a^n b^n$/n>0} is regular or not	**10 Marks**	**L3**	**CO 3**

17.	**a.**	Design PDA for L={$a^n b^n$/n>0} with empty stack design	**10 Marks**	**L3**	**CO 3**
	b.	Design a Turing Machine to perform the proper Subtraction of two unary numbers.	10 Marks	**L3**	**CO 4**
		Or			
18.	**a.**	Design PDA for L={PP^R/Pϵ$(x,y)^+$} with final state acceptance	**10 Marks**	**L3**	**CO 4**
	b.	Design a Turing Machine to accept L={$2^n 3^n$/n>0} and represent in all three forms	**10 Marks**	**L3**	**CO 4**