GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI EXAMINATION – SUMMER 2025

Subject Code:2160704   **Date:26-05-2025**
**Subject Name:Theory of Computation**
Time:10:30 AM TO 01:00 PM   **Total Marks:70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			M
Q.1	**(a)**	Show that $(p \rightarrow \neg p) \lor (\neg p \rightarrow p)$ is a tautology.	**03**
	(b)	Prove that for any; $n \geq 4, n! > 2^n$.	**04**
	(c)	Explain the concept of "Language" and discuss how FA, which accepts or rejects a language, is constructed using a regular expression.	**07**
Q.2	**(a)**	Define: Context Free Language.	**03**
	(b)	Write only the algorithmic steps to minimize a given finite automata.	**04**
	(c)	Apply the rules to convert NFA to FA and create a minimum state FA for the given NFA here.	**07**
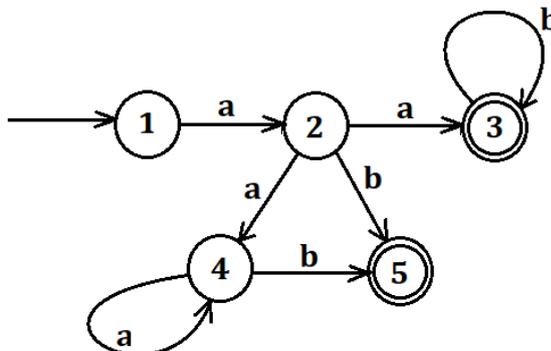
OR

	(c)	Apply pumping lemma for regular languages and prove that the language of palindromes is not regular.	**07**
Q.3	**(a)**	Apply the rules and draw NFA – λ for ((0)* + (1)*) (00)*(1)	**03**
	(b)	Apply the rules to construct NPDA for accepting a palindrome.	**04**
	(c)	Apply the rules and convert regular expression to regular grammar for the given regular expression. $(011 + 1)^* (01)^*$	**07**

Q.3 **(a)** Apply the rules to find λ - closure of set of states for the given NFA- λ and find λ(A), **03**
λ(B), λ(C) and λ(D).

q	δ(q, λ)	δ(q, 0)	δ(q, 1)
A	{B}	{A}	Ø
B	{D}	{C}	Ø
C	Ø	Ø	{B}
D	Ø	{D}	Ø

(b) Explain Context Free Languages. **04**
(c) Apply the method to check if the given grammar is unambiguous or not: **07**
    expr → expr + expr | expr * expr | (expr) | d

Q.4 **(a)** Why is the "Pushdown" automata called "push-down" automata? **03**

(b) Given a regular expression, you can always create a PDA for it. Explain the **04**
statement.

(c) Apply the rules and draw the TM for the language of odd palindromes. **07**

Q.4 **(a)** The FA is more powerful than DPDA. Explain if True or False? **03**
(b) Discuss the pumping lemma for CFL. **04**
(c) Apply the rules and draw the TM to accept the language L = {ab}*{aba} over Σ = **07**
{a,b}*

Q.5 **(a)** Define decidability of a language. **03**
(b) Discuss Chomsky hierarchy. **04**
(c) Discuss Primitive Recursive Functions. **07**

Q.5 **(a)** What is a post correspondence problem? **03**
(b) Discuss Church-Turing thesis. **04**
(c) Show how all computable functions are μ -recursive. **07**

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