

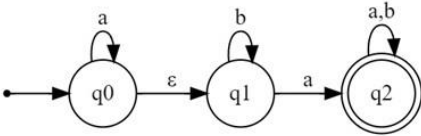
PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech / Int. Btech Summer 2024 - 25 Examination

Semester: 5/9
 Subject Code: 303105306
 Subject Name: Theory of Computation

Date: 13-05-2025
 Time: 10:30 am to 1:00 pm
 Total Marks: 60

Instructions:

1. This question paper comprises of two sections. Write answer of both the sections in separate answer books.
2. From Section A, **Q.1 is compulsory**, From Section B, **Q.1 is compulsory**.
3. Figures to the right indicate full marks.
4. Draw neat and clean drawings & Make suitable assumptions wherever necessary.
5. Start new question on new page.
6. BT- Blooms Taxonomy Levels – Remember-1, Understand -2, Apply-3, Analyse-4, Evaluate-5, Create-6

SECTION-A		Marks	CO	BT
Q.1	Answer the Following Questions			
	A. Provide a brief explanation of the following: <ol style="list-style-type: none"> 1. What is a regular expression? 2. Write a regular expression for strings ending with "01" over $\{0,1\}$. 3. List Chomsky's hierarchy of grammars. 	[06]	1	1,2,3
	B. Answer the following questions in detail: <ol style="list-style-type: none"> 1. What is a Turing Machine (TM)? 2. Construct a DFA for the language $L = \{w \mid w \text{ starts with 'a'}\}$. 3. Construct a DFA for the language $L = \{w \mid w \text{ contains at least one 'b'}\}$. 	[06]	4	3
Q.2	A. State the differences between regular grammar and context-free grammar (CFG).	[04]	3	2
	B. Define an ϵ -NFA (Epsilon-NFA) and explain how it differs from an NFA and DFA.	[05]	2	2
OR				
	B. Convert the following Epsilon NFA to DFA 	[05]	2	3
Q.3	A. State the difference between DFA and NFA with an example.	[04]	2	2
	B. What is the pumping lemma for regular languages?	[05]	2	2
OR				
	B. State the difference between a Finite Automaton, Pushdown Automaton, and Turing Machine.	[05]	1	2
SECTION-B				
Q.1	Answer the Following Questions			
	A. Explain the following <ol style="list-style-type: none"> 1. Define Kleene Closure with an example. 2. Define Positive Closure and explain how it differs from Kleene Closure. 3. State the closure properties of regular languages. 	[06]	2	1

	B. Construct simple regular expressions using Kleene Closure. a) Write a regular expression for all binary strings (0s and 1s). b) Write a regular expression for strings that start with 'a' and contain any number of 'b'. c) Write a regular expression for strings that end in '01' over $\{0,1\}$.	[06]	2	3
Q.2	A. Construct a DFA for the language $L = \{w \mid w \text{ starts with 'a' and ends with 'b'}\}$.	[04]	2	3
	B. Draw a DFA for the language accepting strings starting with 'ab' over input alphabets $\Sigma = \{a, b\}$	[05]	2	3
	OR			
	B. Construct a PDA that accepts $L = \{0^n 1^n \mid n \geq 0\}$	[05]	3	3
Q.3	A. Differentiate between ϵ -NFA, NFA, and DFA with an example.	[04]	2	2
	B. Show that $L = \{0^n 1^n \mid n \geq 1\}$ is not regular using the pumping lemma.	[05]	2	4
	OR			
	B. Describe the 7-tuple formal definition of a Turing Machine (TM) with an example.	[05]	4	2

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