



Daffodil International University
Department of Software Engineering
Faculty of Science & Information Technology
Midterm Examination, Fall 2023

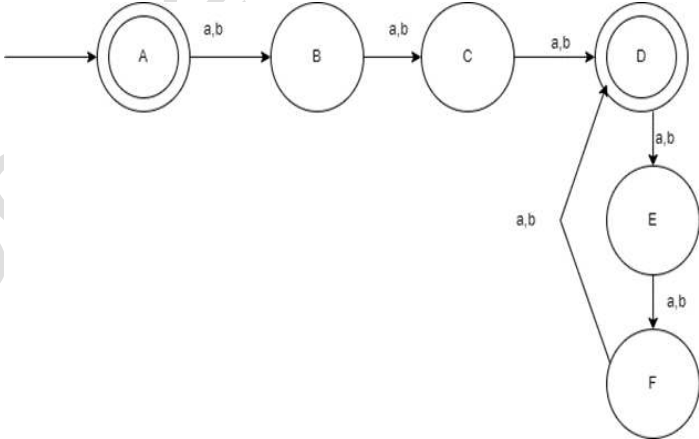
Course Code: **SE234** ; Course Title: **Theory of Computing**
Sections & Teachers: All & FBR

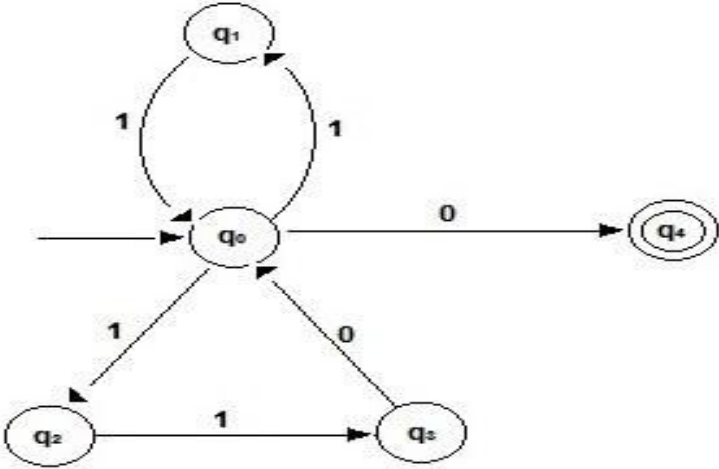
Time: **1 Hour 30 Mins**

Marks: **25**

Answer **ALL** Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	a)	Identify the system in the following case. Are they finite or context free? a) Automated ticket booking system b) Automated Door c) Self driving Car d) ChatGPT	[Marks-2]	CLO-1 Level-4
	b)	Let $\Sigma = \{a, b\}$ and let $L = \{ w \in \Sigma^* \mid w \neq \epsilon \text{ and the first and last character of } w \text{ are the same} \}$. Design a DFA for L.	[Marks-3]	
	c)	Find out the Language for the following finite automata and make it minimal DFA. 	[Marks-3]	
	d)	Explain why not all NFAs are DFAs yet all DFAs are NFA.	[Marks-2]	

2.	a)	Outline the benefits and drawbacks of DFA and NFA in terms of implementation and design.	[Marks-3]	CLO-2 Level-4
	b)	Apply “Subset construction” method to convert the following Non-Deterministic Finite Automata (NFA) to Deterministic Finite Automata (DFA)- $Q = \{q_0, q_1, q_2, q_3, q_4\}$  <pre> graph TD start(()) --> q0((q0)) q0 -- 1 --> q1((q1)) q1 -- 1 --> q0 q0 -- 0 --> q4(((q4))) q0 -- 1 --> q2((q2)) q2 -- 1 --> q3((q3)) q3 -- 0 --> q0 </pre>	[Marks-4]	
	c)	Construct an NFA with $\Sigma = \{0, 1\}$ in which contain double '1' is followed by double '0'.	[Marks-3]	
3.	a)	Explain Regular Expression for “Password Validation” .	[Marks-2]	CLO-3 Level-3
	b)	Construct Regular Expression for the language of all strings over $\{a, b\}$ such that the as and bs are strictly alternating. Examples of strings in the language: $\epsilon, a, b, ab, ba, aba, bab, abab, baba$ Examples of strings not in the language: $bb, aa, abba$	[Marks-3]	