



Daffodil International University
Faculty of Science & Information Technology
Department of Software Engineering
Midterm Examination, Spring 2026

Course Code: SE234; Course Title: Theory of Computing
Sections & Teachers: FJT(A-D), TM(E), FBR (F-J)

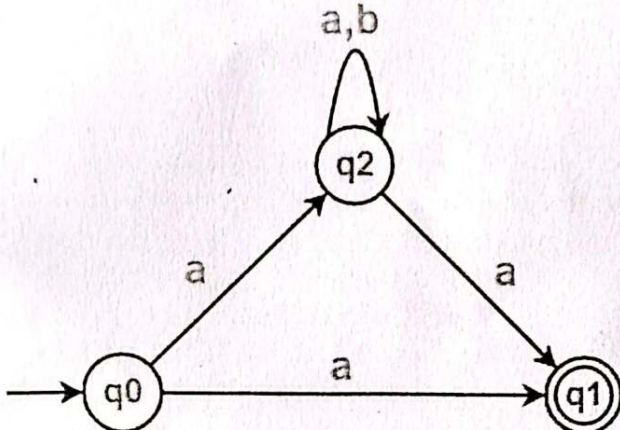
Time: 1 Hour 30 Mins

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)	Draw both a DFA and an NFA for the given language $L = \{ w \in \{0,1\}^* \mid w \text{ contains substring "10"} \}$ and Illustrate how non determinism in an NFA can reduce the number of states compared to an equivalent DFA by constructing both machines for a simple language.	[Marks-3]	CLO-1 Level-3
	b)	Construct state diagram of Deterministic finite Automata for language i) $L = \{ w \mid w \text{ starts with 'a' and contains substring "bb" where input is } \{a,b\} \}$ ii) $L = \{ w \in \{0,1\}^* \mid \text{number of 0's is divisible by 3} \}$	[Marks-4]	
	c)	Demonstrate and identify the following Finite Automata and show epsilon acceptance and 0110101 string acceptance.	[Marks-3]	
<pre> graph LR start(()) --> q0((q0)) q0 -- 0 --> q0 q0 -- 1 --> q1((q1)) q1 -- 1 --> q1 q1 -- 0 --> q2((q2)) q2 -- 0 --> q2 q2 -- 1 --> q3(((q3))) q3 -- 1 --> q3 style start fill:none,stroke:none </pre>				
2.	a)	Illustrate the advantages and disadvantages of Deterministic Finite Automata (DFA) and Non-Deterministic Finite Automata (NFA) in terms of implementation, design, state complexity, memory usage.	[Marks-3]	CLO-2 Level-3

	b) Apply subset construction method to convert the following Non-Deterministic Finite Automata (NFA) to Deterministic Finite Automata (DFA)-  <pre> graph LR start(()) --> q0((q0)) q0 -- a --> q2((q2)) q2 -- a,b --> q2 q2 -- a --> q1(((q1))) q0 -- a --> q1 </pre>	[Marks-4]	
	c) Construct a Non deterministic finite automata where $L = \{w \mid w \text{ strings having 3rd symbol 'a' from right end where } \Sigma = \{a,b,c\}\}$	[Marks-3]	
3.	a) Express Regular Expression for the following Language: $L = \{w \mid w \text{ where each string should have three consecutive b's for input } \{b,c\}\}$ How regular expressions represent patterns in formal languages and evaluate their effectiveness by constructing one example and explaining how it captures the structure of the language?	[Marks-5]	CLO-3 Level-3