Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Final Examination, Spring 2026

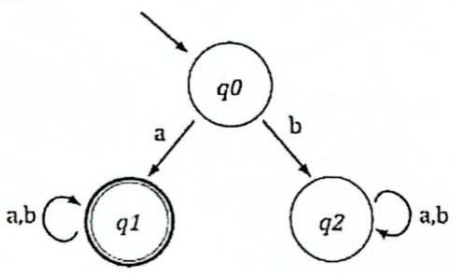
Course Code: SE234; Course Title: Theory of Computing

Sections & Teachers: FJT(A-D), TM(E), FBR (F-J)

Time: 2:00 Hrs **Marks: 40**

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)*	**Demonstrate** the regular language for the following expression and show one supported and one not supported string: (0+1)(0+1)*1(0+1)(0+1)	**[Marks-3]**	**CLO-3** *Level-3*
	b)	Discover Regular Expression for the following languages over {0,1} i. L={w|w starts with 0 and has odd length or ends with 1 and has even length} ii. **L={w|w has exactly one occurrence of 0}**	**[Marks-5]**	
	c)	**Apply** state elimination method to discover the Regular expression from the following DFA 	**[Marks-5]**	
	d)	**Construct** context free grammars to accept the following languages. **i)** L={w|w is a binary string such that the number of 0's in w is divisible by 3} **ii)** L={w|w is a odd length palindrome over the alphabet {x,y}}	**[Marks-5]**	
	e)	$S \rightarrow aB \mid bA$ $A \rightarrow a \mid aS \mid bAA$ $B \rightarrow b \mid bS \mid aBB$	**[Marks5]**	

		i. **Construct** a Parse tree by showing LMD for the string **aabbabba** following the above CFG grammar. ii. Prove that the grammar is ambiguous or not?		
	f)	**Illustrate** a Non deterministic finite automata for the following regular expression by using the Lemma method. $((a+b)(c+d)^*) + (a^*bc^*)$	[Marks-5]	
	g)	Context-free grammar for the Language L $S \rightarrow AB$ $A \rightarrow aAb \mid ab$ $B \rightarrow cBd \mid cd$ Construct a Pushdown Automaton (PDA) that recognizes the language L. Specify the transition functions of the PDA. Demonstrate how the PDA processes the input string aaabbbccdd, showing the sequence of transitions including stack operation.	[Marks-7]	
2.	*a)*	**Picture** a Turing Machine **graphically** over $\sum = \{a,b\}$ for the language, $L = \{a^n bc^n \mid n \geq 1\}$	[Marks-3]	**CLO-4** ***Level-3***
	b)	Turing machines are abstract computational models used to determine which problems can be solved algorithmically **Describe** the working principle of a Turing machine in detail, including its components and step-by-step execution process.	[Marks-2]	

aa bb abba

S - aB | bA
- aB
- aaBB
- aa bSB
- aa bbA
- aa bb aSA
- bA
- bAA
- ba