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Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Midterm Examination, Summer 2026

Course Code: SE 213; Course Title: Digital Electronics & Logic design

Sections & Teachers: A-D(SP), E-H(NIR), I(DAT), J-L(SIK), M(KRY), N(MTE), O(KNA), P(FT)

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)***	**Compute** the following arithmetic operation: $(9AF.8A)_{16} + (476.466)_8 = (?)_{10}$	**[Marks-4]**	**CLO-1** *Level-2*
	b)	**Show** the binary arithmetic operation Division, where Dividend is **1001011** and Divisor is **101.**	**[Marks-3]**	
	c)	A software engineer is debugging a low-level embedded system where memory addresses are represented using 8-bit binary numbers. During execution, the program calculates the offset between two memory locations stored in separate registers. The two registers R_1 and R_2 have the following values stored: $R_1 = (00110101)_2$ $R_2 = (00001111)_2$ To determine the relative displacement, the processor performs subtraction using the 2's complement arithmetic method, rather than direct binary subtraction. The final value is stored in the Result Register (RR). **Calculate** the value that will be stored in the Result Register (RR) after execution of the following operation: $RR = R_1 - R_2$ Use the **2's complement technique** to perform the subtraction and express the final result in binary form.	**[Marks-3]**	
2.	***a)***	The Daffodil International University Library is a large single-floor facility. It uses a smart digital lighting system to control the lights automatically. You have been assigned to design a logic-based monitoring system to determine whether the Library Light (L) should be turned ON. Inputs (Sensors): • D: Dark Level (D = 1 if it is dark outside, D = 0 if there is daylight) • C: Close Status (C = 1 if the library is supposed to be closed, C = 0 if it is open)	**[Marks-4]**	**CLO-2** *Level-3*

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		• P: Presence Status (P = 1 if people are inside the library, P = 0 if the library is empty) Output: • L: Library lights (L = 1 lights ON, L = 0 lights OFF) Light will follow this condition: 1. If the library is open and it is dark outside, regardless of how many people are present. 2. If the library is open, people are present and if it is daylight. Based on the above rules, **derive** the Boolean equation for the output L and **construct** the truth table for all possible input combinations (in the order CDP).		
b)		$F = \overline{(J + K) + (K + L)}$ Simplify the above expression. **Construct** the logic diagrams of the simplified output.	**[Marks-4]**	
c)		**F (A, B, C, D) = ∑ (0,2,6,7,8,10,14,15)** Apply k-map simplification technique to **derive** the most simplified version of the above expressions.	**[Marks-4]**	
d)		**Apply** Parallel adder to compute (P + Q) along with diagram: Where P = 101101 and Q = 11011	**[Marks-3]**	

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