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Daffodil International University

Faculty of Science & Information Technology (FSIT)

Department of Software Engineering

Midterm Examination, Fall 2025

Course Code: SE 213; Course Title: Digital Electronics and Logic Design

Sections & Teachers: 44 - MTE(A,B,E), HI(C,D, F), SP(G-J), NIR(K), MTM(L)

Time: 1 Hour 30 Min **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 using 2's complement: i) $(15)_{10}$-$(31)_{10}$	[Marks-3]	CLO-1 *Level-2*
	b)	In Planet Xylon, scientists have discovered a strange phenomenon in the colony's air filtration system. You have been assigned to design a logic-based monitoring system to determine whether the Air Alarm (A) should be triggered. The alarm depends on the following environmental factors: Inputs (Sensors): • S: Smoke Level (S = 1 if smoke is detected, S = 0 otherwise) • G: Gas Concentration (G = 1 if gas concentration is high, G = 0 otherwise) • T: Temperature (T = 1 if temperature is high, T = 0 otherwise) Output: • A: Air Alarm (A = 1 if the alarm should activate, A = 0 otherwise) The alarm conditions are as follows: 1. The alarm will activate if smoke and gas are both detected simultaneously, regardless of temperature. 2. The alarm will also activate if smoke is present and the temperature is high, even if gas is not detected. 3. If no smoke is detected, the alarm will still activate when gas concentration is high and temperature is high. Based on the above rules, **express** the design of the logic system for the Air Alarm. Construct the truth table for all possible input combinations (in the order SGT), derive the Boolean equation for the output A, and draw the corresponding logic circuit diagram using basic logic gates.	[Marks-7]	
2.	*a)*	i) **Construct** the Full Adder circuit with Truth Table and Logic Equation using Sum of Products (SOP). ii) Apply Parallel full adder to **compute** (A + B) the following operation along with diagram: Where A = 1 1 1 1 1 0 and B = 1 0 0 1 1	[Marks-4+3]	CLO-2 *Level-3*
	b)	F (A, B, C, D) = C'(A'BD'+D') +AB'C+BD' Apply k-map simplification technique to simplify the above expressions. **Construct** the logic diagrams of the simplified output.	[Marks-8]	