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Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Mid Term Examination, Fall 2025

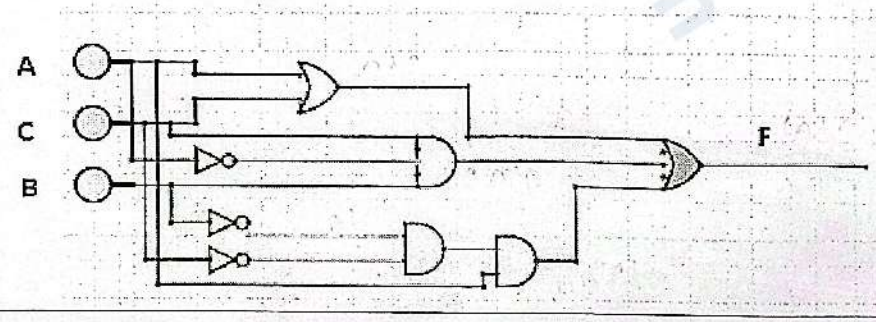
Course Code: CSE223, Course Title: Digital Logic Design

Level: 2 Term: 2 Batch: 66

Time: 01:30 Hrs **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)*	**Convert** the following number from base 7 to base 9. $(562.3421)_7 = (?)_9$	[4]	
	b)	**Generate** the Boolean expression from the given circuit and **simplify** it using Boolean laws and **draw** the circuit diagram of simplified expression using NAND Gates only. 	[6]	**CO1**
2.		**Simplify** this Boolean function using K-map with don't care term. $F(A, B, C, D) = \sum(0, 1, 4, 5, 7, 10, 12, 15) + \sum d(2, 8, 9, 13)$	[5]	
3.	*a)*	**Draw** the 4-bit adder-subtractor circuit and use it to **find** A-B where $A = (1011)_2$ and $B = (1101)_2$.	[4]	**CO2**
	b)	**Explain** how a 4x16 decoder can be constructed with two 3x8 decoders and enable pin using block diagrams as components.	[2]	
	a)	An automated greenhouse is equipped with four binary sensors: • **A:** High temperature (1 = High, 0 = Normal) • **B:** Low soil moisture (1 = Low, 0 = Normal) • **C:** Low humidity (1 = Low, 0 = Normal) • **D:** System maintenance mode (1 = Maintenance ON, 0 = Maintenance OFF)	[4]	**CO3**

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The **Watering System output (W)** should operate according to the following control logic (1=ON, 0=OFF):

1. If the **soil moisture is low** and the system is **not in maintenance mode**, the watering system must turn **ON**.
2. If **temperature is high** and **humidity is low**, the watering system must turn **ON**.
3. If **temperature is high** and **soil moisture is low** but **humidity is normal**, the watering system must turn **ON**.
4. If the system is in **maintenance mode**, the watering system must always remain **OFF**, regardless of other sensor values.
5. If **humidity is low** while **soil moisture is normal** and **maintenance is OFF**, the watering system must turn **ON**.

Construct the complete truth table, Boolean expression and circuit diagram.