



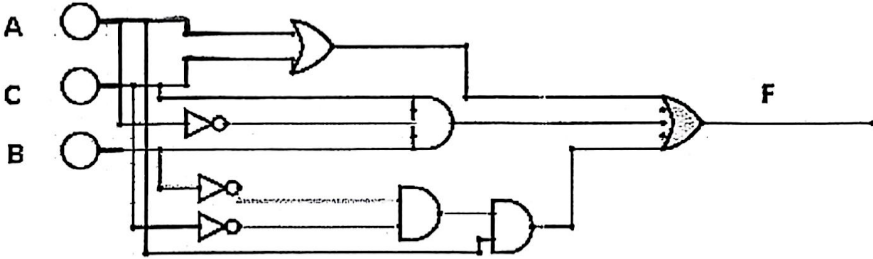
Daffodil International University  
Faculty of Science & Information Technology  
Department of Computer Science & Engineering  
Mid Term Examination, Fall 2025  
Course Code: CSE223, Course Title: Digital Logic Design  
Level: 2 Term: 2 Batch: 66

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.	<p>a) Convert the following number from base 7 to base 9. <math>(562.3421)_7 = (?)_9</math></p>	[4]	
	<p>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.</p> 	[6]	CO1
2.	<p>Simplify this Boolean function using K-map with don't care term. <math>F(A, B, C, D) = \sum(0, 1, 4, 5, 7, 10, 12, 15) + \sum d(2, 8, 9, 13)</math></p>	[5]	
3.	<p>a) Draw the 4-bit adder-subtractor circuit and use it to find A-B where <math>A = (1011)_2</math> and <math>B = (1101)_2</math>.</p>	[4]	CO2
	<p>b) Explain how a 4x16 decoder can be constructed with two 3x8 decoders and enable pin using block diagrams as components.</p>	[2]	
	<p>c) An automated greenhouse is equipped with four binary sensors:</p> <ul style="list-style-type: none"> <li>A: High temperature (1 = High, 0 = Normal)</li> <li>B: Low soil moisture (1 = Low, 0 = Normal)</li> <li>C: Low humidity (1 = Low, 0 = Normal)</li> <li>D: System maintenance mode (1 = Maintenance ON, 0 = Maintenance OFF)</li> </ul>	[4]	CO3

<p>The <b>Watering System output (W)</b> should operate according to the following control logic (1=ON, 0=OFF):</p>	
---	--

- |   |  |
|---|--|
| <ol style="list-style-type: none"><li>1. If the <b>soil moisture is low</b> and the system is <b>not in maintenance mode</b>, the watering system must turn <b>ON</b>.</li><li>2. If <b>temperature is high</b> and <b>humidity is low</b>, the watering system must turn <b>ON</b>.</li><li>3. If <b>temperature is high</b> and <b>soil moisture is low</b> but <b>humidity is normal</b>, the watering system must turn <b>ON</b>.</li><li>4. If the system is in <b>maintenance mode</b>, the watering system must always remain <b>OFF</b>, regardless of other sensor values.</li><li>5. If <b>humidity is low</b> while <b>soil moisture is normal</b> and <b>maintenance is OFF</b>, the watering system must turn <b>ON</b>.</li></ol> |  |
|---|--|

<p>Construct the complete truth table, Boolean expression and circuit diagram.</p>	
--	--