Ahsanullah University of Science and Technology

Course No: CSE3109 **Course Name:** Digital System Design

Semester: Fall20 **Date:** 13.7.2021

Time: 40+10 mins

*****Marks of each question is given in the right side of every question.**

1. Design an Arithmetic Logic Unit (ALU) using the following table:

S2	S1	S0	Output
0	0	1	Ai – Bi - 1
0	1	1	Ai - 1
1	0	1	Ai
1	1	1	Ai + 1
1	1	0	Ai | Bi
1	0	0	Ai . Bi

I. Design the table and derive the equations. Mention the output function names (explanations) in another column. 06

II. Write down the values of the selector bit for differentiating between the arithmetic and logical operations. 01

2. Kareem claims that subtraction with borrow operation can activate the final carry out if the two operands are equal. Do you agree with him? Explain with proper examples. 03

3. Write down the differences between a half adder and a full adder. Design a full adder using two half adders. Derive the simplified equations of S and C_{out}. 03

4. From the following table, how can we get the desired 'AND' operation from the 'Equivalence' operation? Mention the value to put in X_i and Y_i for this case and prove your logic. 03

S_2	S_1	S_0	X_i	Y_i	C_i	$F_i = X_i \oplus Y_i$	Operation	Target
1	0	0	A_i	0	0	A_i	Transfer	OR
1	0	1	A_i	B_i	0	A_i xor B_i	XOR	XOR
1	1	0	A_i	B_i'	0	A_i xnor B_i	Equivalence	AND
1	1	1	A_i	1	0	A_i xor 1	NOT	NOT

5. Suppose, you have two numbers 1100 and 1001 in 2's complement format. Perform addition operation and mention the values of 4 status flags. 04