Military Institute of Science and Technology
Department of Computer Science and Engineering
CSE-17A, Level-3, Term-II
CSE-316 (Digital System Design Sessional)
Project-2

Instructions:

1. Design the 4-bit ALU with full adder and basic gates [Use of multiplexer is strictly prohibited].
2. In next week first you have to submit the design of the ALU [Hardcopy(in paper) and softcopy(in Circuit Maker) both].
3. Then in next to next week you have to submit the final hardware connection.
4. Finally you have to submit a report on ALU.

Problem (Grp-1 & Grp-2):
Design a 4-bit Arithmetic Logic Unit (ALU), which generates the following operations. Also show four status register (Sign flag, Carry flag, Overflow flag, Zero flag).

Operation	Function
F = A	Transfer A
F = A + 1	Increment A
F = A – B – 1	Subtract with borrow
F = A – B	Subtraction
F = A OR B	OR
F = A AND B	AND

Problem (Grp-3 & Grp-4):
Design a 4-bit Arithmetic Logic Unit (ALU), which generates the following operations. Also show four status register (Sign flag, Carry flag, Overflow flag, Zero flag).

Operation	Function
F = A + B	Addition
F = A + B + 1	Add with carry
F = A – 1	Decrement A
F = A	Transfer A
F = A XOR B	Exclusive-OR
F = A'	Complement A

Problem (Grp-5 & Grp-9):
Design a 4-bit Arithmetic Logic Unit (ALU), which generates the following operations. Also show four status register (Sign flag, Carry flag, Overflow flag, Zero flag).

Operation	Function
F = B – A – 1	Subtract with borrow
F = B – A	Subtraction
F = B – 1	Decrement B
F = B	Transfer B
F = A XOR B	Exclusive-OR
F = B'	Complement B

Problem (Grp-6 & Grp-7):
Design a 4-bit Arithmetic Logic Unit (ALU), which generates the following operations. Also show four status register (Sign flag, Carry flag, Overflow flag, Zero flag).

Operation	Function
F = A + B	Addition
F = A + B + 1	Add with carry
F = A – B – 1	Subtract with borrow
F = A – B	Subtraction
F = A XOR B	Exclusive-OR
F = A XNOR B	Exclusive-NOR

Problem (Grp-8 & Grp-10):
Design a 4-bit Arithmetic Logic Unit (ALU), which generates the following operations. Also show four status register (Sign flag, Carry flag, Overflow flag, Zero flag).

Operation	Function
F = A – B – 1	Subtract with borrow
F = A – B	Subtraction
F = A – 1	Decrement A
F = A	Transfer A
F = A XNOR B	Exclusive-NOR
F = A'	Complement A

Problem (Grp-11):
Design a 4-bit Arithmetic Logic Unit (ALU), which generates the following operations. Also show four status register (Sign flag, Carry flag, Overflow flag, Zero flag).

Operation	Function
F = A	Transfer A
F = A + 1	Increment A
F = A – 1	Decrement A
F = A	Transfer A
F = A OR B	OR
F = A'	Complement A