UNIVERSITY OF INFOMATION TECH. **FINAL TERM TEST – SEM. I (2018-2019)**

FACULTY OF COMPUTER ENGR. **DIGITAL LOGIC DESIGN**

DURATION: 90 minutes

*(Students are only **allowed** to use 6 pages A4)*

1. Let's design below arithmetic operation circuits: (4 points)

a. Design a circuit to perform the Absolute operation (0.5 points)
b. Design a circuit to perform the Addition/Subtraction operations (1 points)
c. Design a circuit to perform the Min/Max operation (1 points)
d. Design a shared circuit to perform the Absolute/Addition/Subtraction/Max following the below operation table (1.5 đ)

C1	C0	Operation
0	0	Absolute
0	1	Addition
1	0	Subtraction
1	1	Max

2. Let's design the zero's – counter which counts the number of bit "0" of the bit sequence input. Assume, the right shifter (bit "1" is loaded into MSB bit after each shifting) is available (4 points):
   a. Derive a data-path module for zero's – counter (1 point)
   b. Derive an ASM chart for the zero's – counter (1 point)
   c. Derive a state-action table for the zero's – counter (1 point)
   d. Draw the circuit including data-path module and controller module of the zero's – counter. (1 point)

3. Let's start the first steps to design a simple processor (two-address instructions and an register file) to execute the equation: $z = (y^2 + 1)(x - 1)^3$, where, x, y are stored in data memory, z is also stored back the data memory after execution:
   a. Which instructions do we need for the instruction set to calculate above equation? (1 point)
   b. Derive the instruction formats for all instructions in (a) (1 point)
   c. Write the sequence of instructions to compute the equation (1 point)

Approved by Head of Subject **Designed by**