**Lecture 04 Assignments**

1) Create the circuit schematic of a **4-line Decoder** using its truth table. Show the address ranges which are used to select **four** memory chips (each with size **16K × 8**) by the decoder.

2) Create the circuit schematic of a **adder** using its truth table (show both half and full adders). Show a 4-bit adder/subtractor circuit from the full adders (show how it can perform a 4-bit addition and subtraction with the help of 4-bit numbers).

3) Describe how the adder/subtractor (from the **question** **2**) can act as a 4-bit **magnitude comparator**.

4) Show the circuit schematic of a 2-bit **multiplier** and show a 2-bit multiplication on the multiplier with the help of 2-bit numbers.

5) [4 Points] Answer the following based on the circuit schematic which is shown in **Figure1** (where ***A*** and ***B*** are two *N*-bit binary inputs and ***Cout*** is the carryout bit):



**Figure 1.**

 5.1 (1 point) Identify the circuit.

5.2 (1 point) Find the output, *Y* when *F*2 = 0, *F*1 = 1, and *F*0 = 0.

 5.3 (1 point) Find the output, *Y* when *F*2 = 1, *F*1 = 0, and *F*0 = 1.

5.4 (1 point) Find the output, *Y* when *F*2 = 1, *F*1 = 1, and *F*0 = 0.

6) Sketch the schematics of an ***N*-bit ALU** (**Arithmetic and Logic Unit**) with four *N*-bit functions such as *addition*, *subtraction*, *OR operation* and *parity checker*.

7) Describe any **three main differences** between **SRAM** (Static Random Access Memory) and **DRAM** (Dynamic Random Access Memory). Show a **1-bit DRAM** cell and explain its *read* and *write* operation.

8) Assume that a computer system has a 4Gbyte main memory (organization: 4G x 8). Show the maximum number of address bits which are used by the system to access the main memory.

9) Briefly describe the following terms:

 9.1) Read Only Memory (ROM)

 9.2) Erasable Read Only Memory (EROM)

 9.3) EEPROM (Electrically Erasable Programmable ROM)

 9.3) Flash memory