Computer Organization and Architecture   **Practice Sheet 1**   Dr. Amin Allam

Qa $\Rightarrow$ A 4×1 multiplexer with selection inputs S_1 and S_0 selects input 0 when $S_1 S_0 = 00$, selects input 1 when $S_1 S_0 = 01$, selects input 2 when $S_1 S_0 = 10$, and selects input 3 when $S_1 S_0 = 11$.

For questions 1 to 6, consider an electronic circuit which has:

• Inputs: S_1, S_0, C_0, the binary number $A = A_1 A_0$, and the binary number $B = B_1 B_0$.

• output: the binary number $D = D_1 D_0$.

The circuit consists of the following items:

• A 4×1 multiplexer with selection inputs S_1, S_0, and 4 inputs: Q_0, Q_1, Q_2, Q_3, and output: M_0.

• Another 4×1 multiplexer with selection inputs S_1, S_0, and 4 inputs: R_0, R_1, R_2, R_3, and output: M_1.

• A full-adder with inputs: A_0, M_0, C_0 and outputs: C_1 (carry), D_0 (sum).

• Another full-adder with inputs: A_1, M_1, C_1 and outputs: C_2 (carry), D_1 (sum).

• B_0 is connected to Q_0.   • B_1 is connected to R_0.   • $\overline{B_0}$ is connected to Q_1.   • $\overline{B_1}$ is connected to R_1.

• Logic 0 is connected to both Q_2 and R_2.   • Logic 1 is connected to both Q_3 and R_3.

1 When $S_1 = 0$, $S_0 = 0$, $C_0 = 0$:

A $D = A + B$ **B** $D = A - B$ **C** $D = A + 1$ **D** $D = A - 1$ **E** $D = A$

2 When $S_1 = 0$, $S_0 = 1$, $C_0 = 1$:

A $D = A + B$ **B** $D = A - B$ **C** $D = A + 1$ **D** $D = A - 1$ **E** $D = A$

3 When $S_1 = 1$, $S_0 = 0$, $C_0 = 0$:

A $D = A + B$ **B** $D = A - B$ **C** $D = A + 1$ **D** $D = A - 1$ **E** $D = A$

4 When $S_1 = 1$, $S_0 = 0$, $C_0 = 1$:

A $D = A + B$ **B** $D = A - B$ **C** $D = A + 1$ **D** $D = A - 1$ **E** $D = A$

5 When $S_1 = 1$, $S_0 = 1$, $C_0 = 0$:

A $D = A + B$ **B** $D = A - B$ **C** $D = A + 1$ **D** $D = A - 1$ **E** $D = A$

6 When $S_1 = 1$, $S_0 = 1$, $C_0 = 1$:

A $D = A + B$ **B** $D = A - B$ **C** $D = A + 1$ **D** $D = A - 1$ **E** $D = A$