Ahsanullah University of Science and Technology

Department of Computer Science and Engineering

Course Code: CSE3110 Course Name: Digital System Design Lab

Semester: Spring 2022

**Group I**

Design the following 4-bit ALU (Arithmetic Logic Unit):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S2** | **S1** | **S0** | **Output** | **Function** |
|  |  |  |  |  |
| 1 | 1 | 0 | Ai + Bi +1 | Add with Carry |
|  |  |  |  |  |
| 0 | 1 | 1 | Ai + 1 | Increment A |
|  |  |  |  |  |
| 1 | 1 | 1 | Ai + Bi | Add |
|  |  |  |  |  |
| 0 | 1 | 0 | Ai + 1 + 1 | Transfer A with Carry |
|  |  |  |  |  |
| 1 | 0 | X | Ai . Bi | AND |
|  |  |  |  |  |
| 0 | 0 | X | Ai**’** | Complement A |

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**Group II**

Design the following 4-bit ALU (Arithmetic Logic Unit):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S2** | **S1** | **S0** | **Output** | **Function** |
|  |  |  |  |  |
| 1 | 1 | 0 | Ai-Bi-1 | Subtract with Borrow |
| 1 | 1 | 1 | Ai + Bi +1 | Add with Carry |
| 0 | 1 | 0 | Ai + Bi | Add |
| 0 | 1 | 1 | Ai - 1 | Decrement A |
| 1 | 0 | X | Ai I Bi | OR |
| 0 | 0 | X | Ai xor Bi | XOR |
|  |  |  |  |  |

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**Group III**

Design the following 4-bit ALU (Arithmetic Logic Unit):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S2** | **S1** | **S0** | **Output** | **Function** |
|  |  |  |  |  |
| 1 | 0 | 1 | Ai - Bi | Subtract |
| 1 | 0 | 0 | Ai + 1 + 1 | Transfer A with Carry |
| 0 | 0 | 1 | Ai - 1 | Decrement A |
| 0 | 0 | 0 | Ai - Bi - 1 | Subtract with Borrow |
| 1 | 1 | X | **Ai’** | Complement A |
| 0 | 1 | X | Ai . Bi | AND |
|  |  |  |  |  |

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**Group IV**

Design the following 4-bit ALU (Arithmetic Logic Unit):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S2** | **S1** | **S0** | **Output** | **Function** |
|  |  |  |  |  |
| 0 | 0 | 0 | Ai - 1 | Decrement A |
| 0 | 0 | 1 | Ai - Bi - 1 | Subtraction with Borrow |
| 1 | 0 | 1 | Ai + 1 + 1 | Transfer A with Carry |
| 1 | 0 | 0 | Ai + Bi | Add |
| 1 | 1 | X | Ai xor Bi | XOR |
| 0 | 1 | X | Ai | Bi | OR |
|  |  |  |  |  |

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**Group V**

Design the following 4-bit ALU (Arithmetic Logic Unit):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S2** | **S1** | **S0** | **Output** | **Function** |
|  |  |  |  |  |
| 0 | 1 | 0 | Ai | Transfer A |
| 0 | 0 | 1 | Ai – Bi | Subtract |
| 0 | 0 | 0 | Ai + 1 | Increment A |
| 0 | 1 | 1 | Ai + Bi + 1 | Add with Carry |
| 1 | 0 | X | **Ai’** | Complement A |
| 1 | 1 | X | Ai xor Bi | XOR |
|  |  |  |  |  |