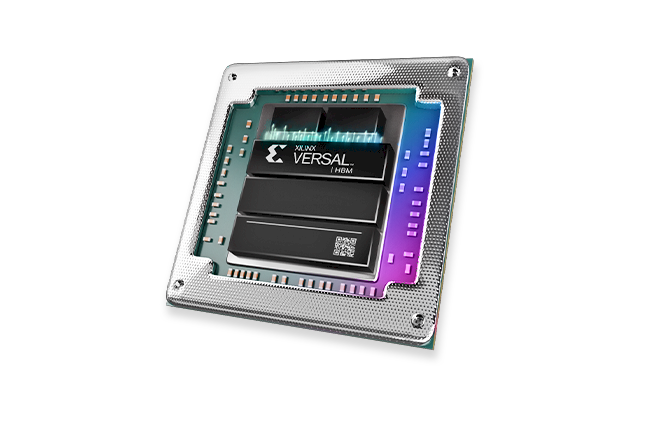
**EC204**

**Digital System Design Lab**

**Lab – 3**



**Utkarsh R Mahajan**

**201EC164**

**1]** **Design a circuit to convert 4 bit Binary to Gray and 4 bit Gray to Binary Code using XOR gates**

**Diagram

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**Result: Results Obtained can be seen via the analyzed circuit Table, which matches the initial Truth table for the convertors.**

**2]** **Design an Excess-3 to BCD code converter and implement using 8:1 multiplexer. Use the multiplexer available in Plexers library in logisim.**

**We take input excess-3 as ABCD (A is MSB)**

**We can send the input BCD Via Selector and then A via Input I.**

Diagram, schematic

Description automatically generated

**Result: the table obtained via analyzing circuit matches the required result.**

**3]** **Design a circuit to implement the following functions using (a) 4 to 16 decoder (b) 4 to 1 Multiplexer. Use the Multiplexer and decoder available in Plexers library in logisim.**

**F1(A,B,C,D) = ∑m (11,12,13,14,15)**

**F2(A,B,C,D) = ∑m (3,7,11,12,13,15)**

**F3(A,B,C,D) = ∑m (3,7,12,13,14,15)**

1. **Using decoder**

**We can take input as ABCD while using OR gates for getting the correct output for required functions.**

**Diagram, schematic

Description automatically generated**

**(b) 4 to 1 Multiplexer**

**Taking AB as input in Selector for MUX and C and D at inputs I0-I4. We can obtain the following diagram.**

**Diagram

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**Results:from the Logic table obtained from circuit analysis, we can see that it matches with the given functions.**

**4]** **Design a circuit to implement the following function using 16 to 1 Multiplexer. Use the Multiplexer available in Plexers library in logisim. F = A'B'C'D'(R'+S) + AB'C'D' + A'B'C'D + ABC'DQR + AB'C'D + A'B'CD (Q'+T) + ABCDS'T + AB'CD + A'BCD**

**Taking selection input as ABCD for Mux, and using logic gates for setting up specific inputs, we can obtain our circuit as follows. Diagram, schematic

Description automatically generated**

**Results:**

**We obtain the result as required.**

**5]** **Implement (a) 4 bit controllable adder/subtractor (b) 8 bit controllable adder/subtractor. Use the Adder available in Arithmetic library in Logisim**

**By settings a toggle for Subtraction or Addition, and using xor gates with b input and the toggle input. Connecting them with respective A’s bit to full adders which are in series. Connecting consecutive Couts to each other we can obtain the following circuit.**

1. **4bit adder/subtractor**

**Diagram

Description automatically generated**

1. **Similarly for 8bit adder/subtractor**

**Diagram, engineering drawing

Description automatically generated**