LAPORAN PRAKTIKUM
PENGANTAR SISTEM DIGITAL

DOSEN : Arif Rifai Dwiyanto, ST., MTI

Oleh:

Muhammad Rafli Rizkyanto

202410715176

FAKULTAS ILMU KOMPUTER
PROGRAM STUDI INFORMATIKA
UNIVERSITAS BHAYANGKARA JAKARTA RAYA
2025

Tujuan:

1. Memahami konsep kerja Multiplexer (MUX) dan Demultiplexer (DEMUX).
2. Mampu merancang dan mensimulasikan (MUX) dan (DEMUX) menggunakan Logisim.

Pendahuluan

- **Multiplexer:** Rangkaian logika yang memilih salah satu dari banyak input untuk diteruskan ke output tunggal berdasarkan kombinasi sinyal kontrol (select lines).
- **Demultiplexer:** Rangkaian logika yang mengarahkan satu input ke salah satu dari banyak output berdasarkan kombinasi sinyal kontrol.

Langkah-Langkah Praktikum

1. Multiplexer

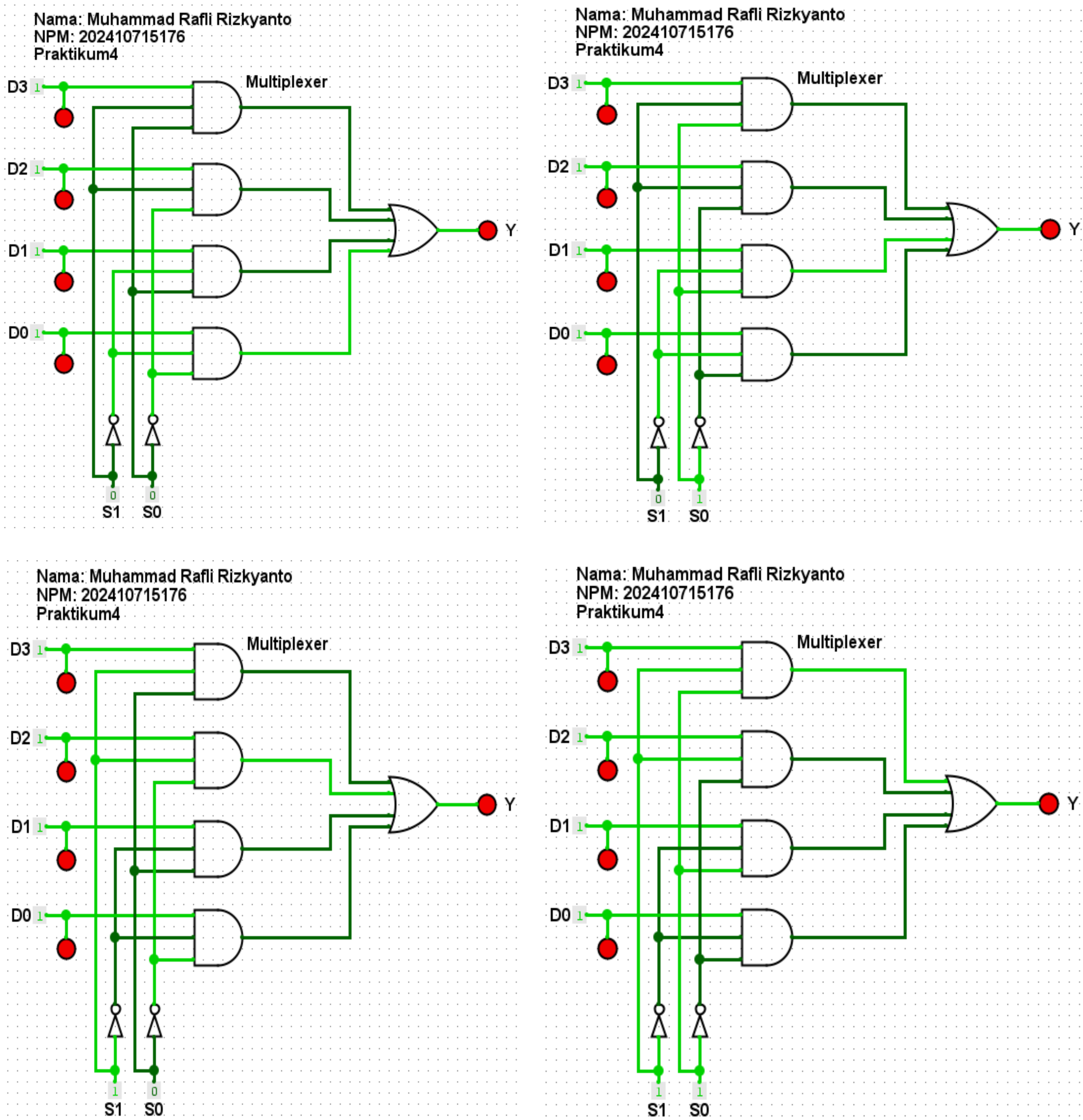
- N-to-1 Multiplexer: Rangkaian yg memiliki N input, $\log_2$ (N) select lines, dan 1 output.
- Contoh: 4-to-1 Multiplexer
  - Input : D_0,D_1,D_2,D_3
  - Select Lines : S_0, S_1
  - Output : Y.
- Ekspresi logika output:

$$Y = (\overline{S_1} \cdot \overline{S_0} \cdot I_0) + (\overline{S_1} \cdot S_0 \cdot I_1) + (S_1 \cdot \overline{S_0} \cdot I_2) + (S_1 \cdot S_0 \cdot I_3)$$

Tabel Kebeneran

S_1	S_0	Output Y
0	0	D_0
0	1	D_1
1	0	D_2
1	1	D_3

Implementasi di Logisim



2. Demultiplexer

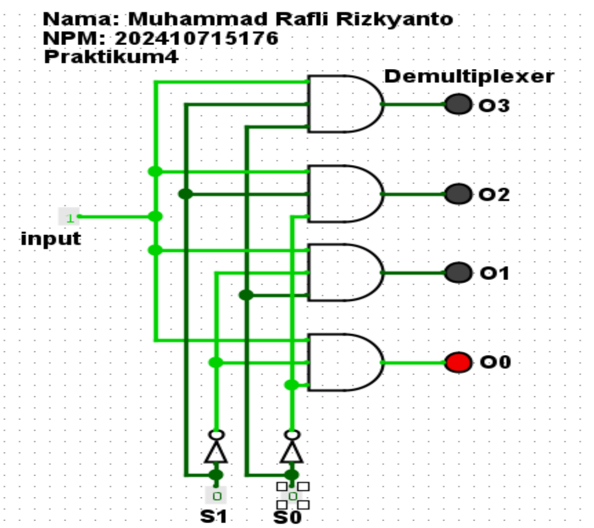
- 1-to-N Demultiplexer: Rangkaian yg memiliki 1 input, log$_{fo2}$(N)\log_2(N)log2(N) select lines, dan NNN output.
- Contoh: 1-to-4 Demultiplexer
  - input: 1
  - Select Lines: S0,S1
  - Output: O_0,O_1,O_2,O_3.
- Ekspresi logika output:

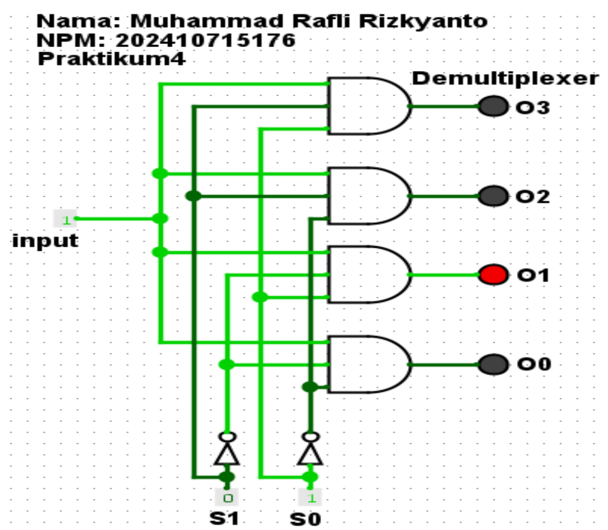
$O_0 = \overline{S1} \cdot \overline{S0} \cdot I$
$O_1 = \overline{S1} \cdot S0 \cdot I$
$O_2 = S1 \cdot \overline{S0} \cdot I$
$O_3 = S1 \cdot S0 \cdot I$

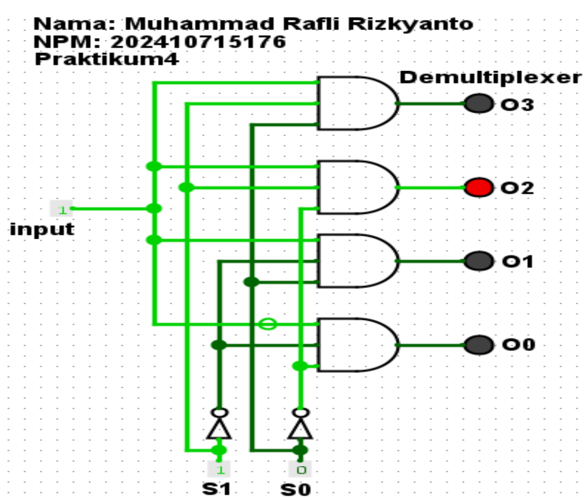
Tabel Kebenaran

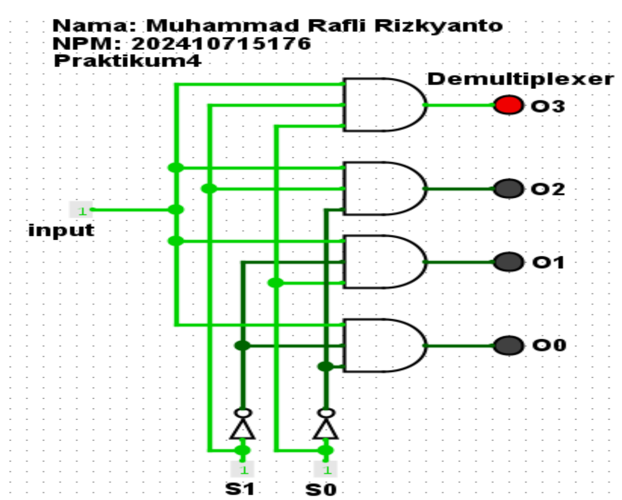
S_1	S_0	Output O_0	Output O_1	Output O_2	Output O_3
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

Implementasi di Logisim

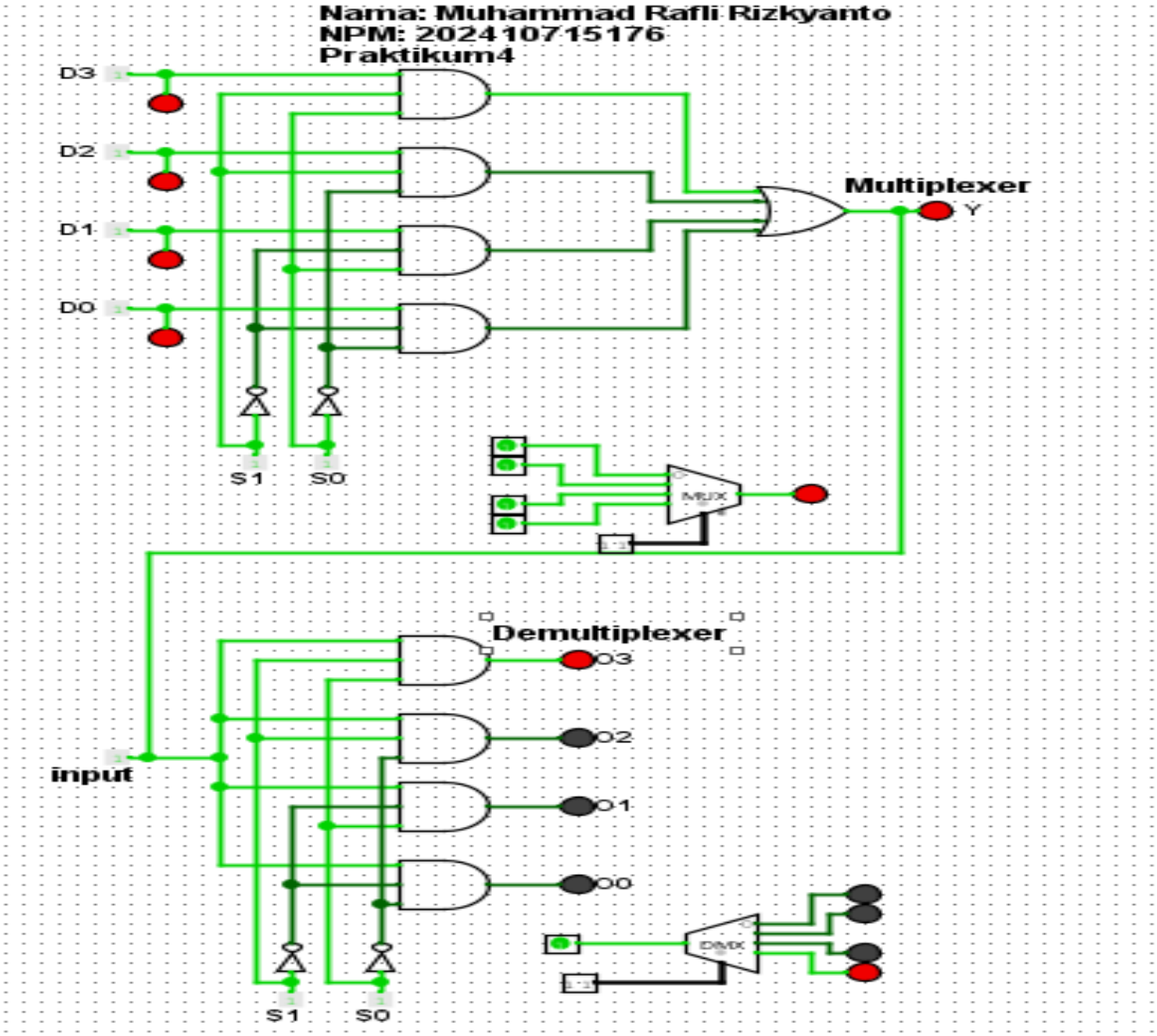








Implementasi Gabungan Multiplexer-Demultiplexer



Tugas Multiplexer 8-to-1

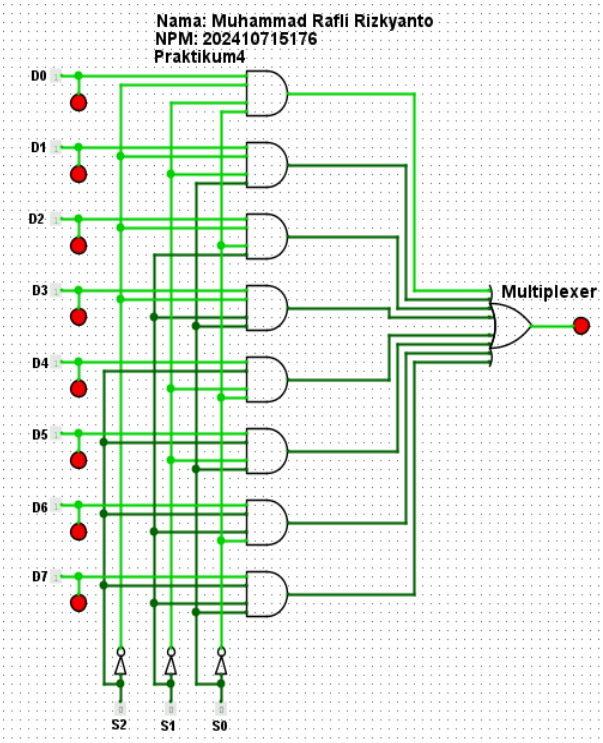
- N-to-1 Multiplexer: Rangkaian yg memiliki N input, $\log_2$ (N) select lines, dan 1 output.
- Contoh: 8-to-1 Multiplexer
  - Input : D_0,D_1,D_2,D_3,D_4,D_5,D_6,D_7
  - Select Lines : S_0,S_1,S_2
  - Output : Y.
- Ekpsresi logika Output:

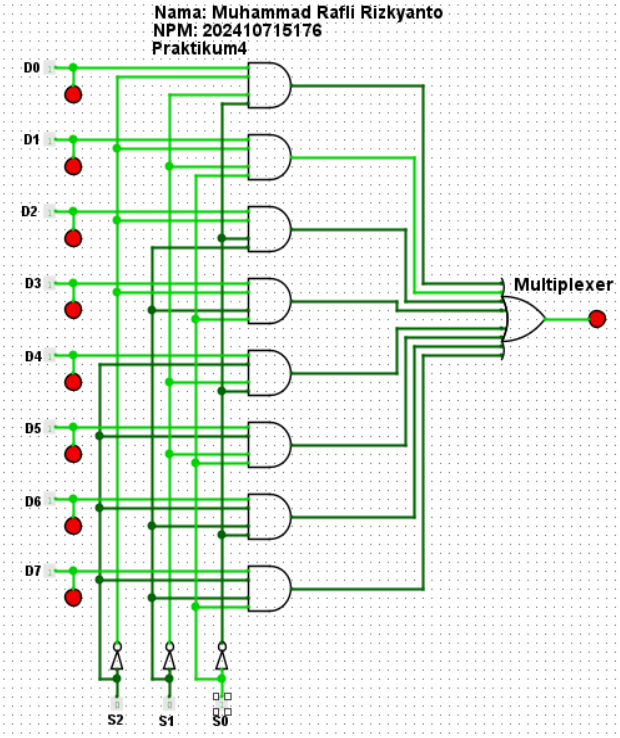
$Y = (\overline{S2} \cdot \overline{S1} \cdot \overline{S0} \cdot D0) + (\overline{S2} \cdot \overline{S1} \cdot S0 \cdot D1) + (\overline{S0} \cdot S1 \cdot \overline{S0} \cdot D2) + (\overline{S2} \cdot S1 \cdot \overline{S0} \cdot D2) + (\overline{S2} \cdot S1 \cdot S0 \cdot D3) + (S2 \cdot \overline{S1} \cdot \overline{S0} \cdot D4) + (S2 \cdot \overline{S1} \cdot S0 \cdot D5) + (S2 \cdot S1 \cdot \overline{S0} \cdot D6) + (S2 \cdot S1 \cdot S0 \cdot D7)$.

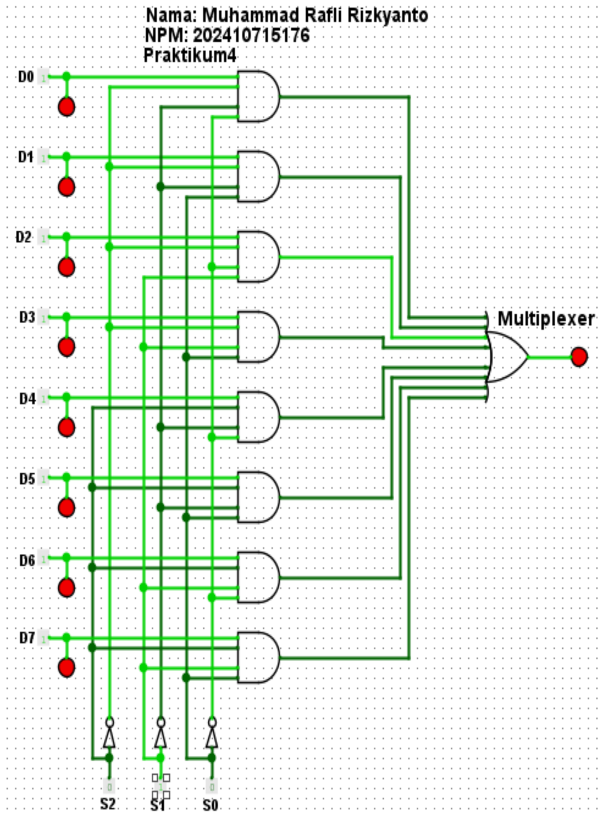
Tabel Kebeneran

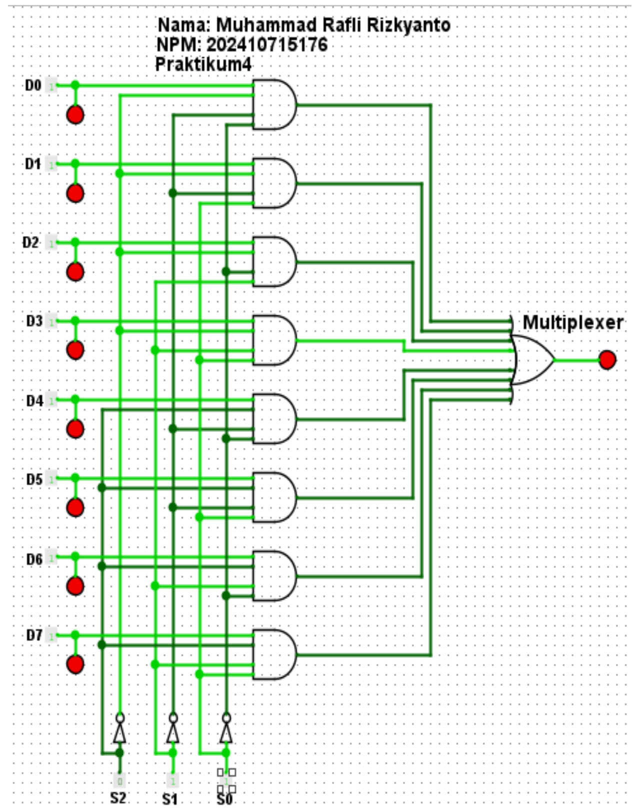
S_2	S_1	S_0	Output Y
0	0	0	D_0
0	0	1	D_1
0	1	0	D_2
0	1	1	D_3
1	0	0	D_4
1	0	1	D_5
1	1	0	D_6
1	1	1	D_7

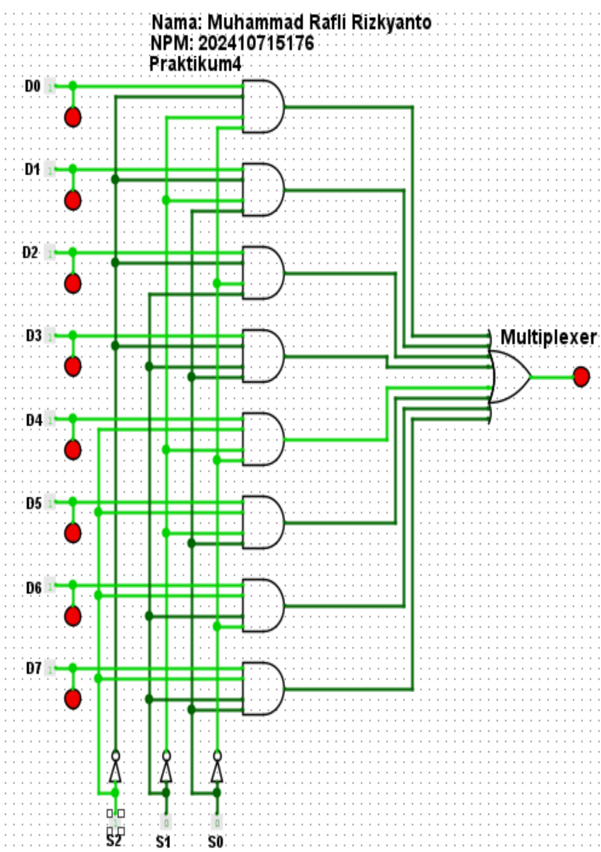
Implementasi di Logisim

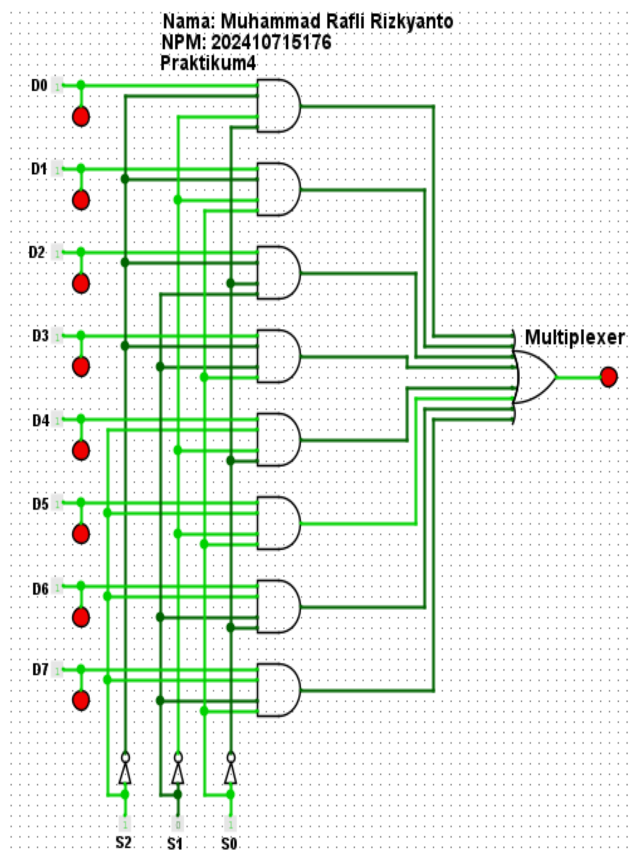


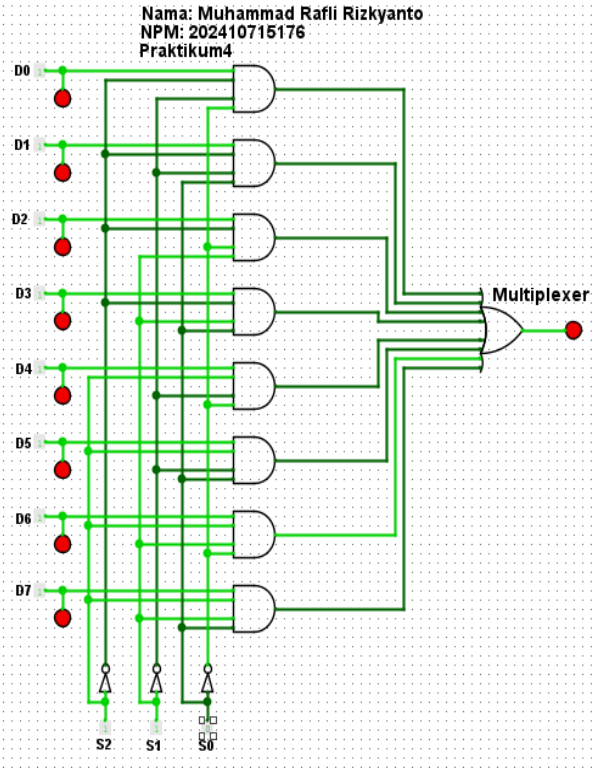


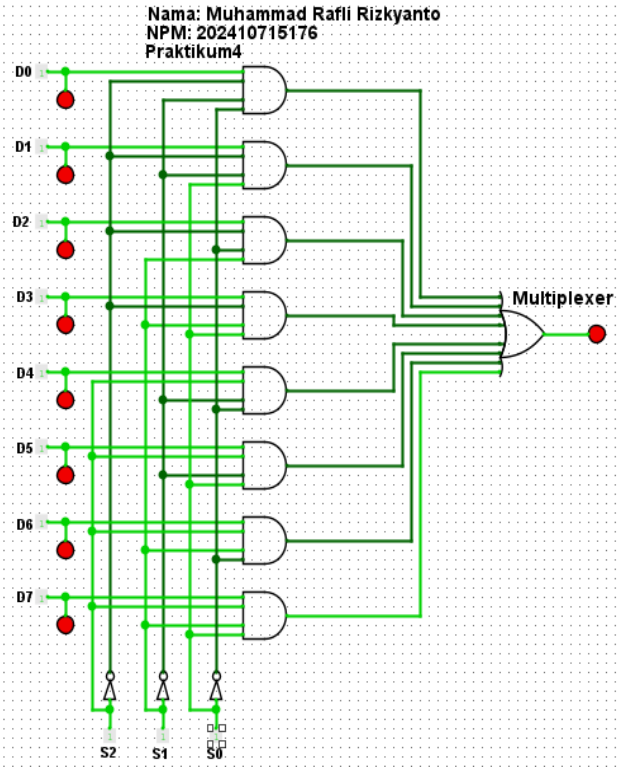

Nama: Muhammad Rafli Rizkyanto
NPM: 202410715176
Praktikum4
D0
D1
D2
D3
D4
D5
D6
D7
Multiplexer
S2
S1
S0


Nama: Muhammad Rafli Rizkyanto
NPM: 202410715176
Praktikum4
D0
D1
D2
D3
D4
D5
D6
D7
Multiplexer
S2
S1
S0


Nama: Muhammad Rafli Rizkyanto
NPM: 202410715176
Praktikum4
D0
D1
D2
D3
D4
D5
D6
D7
Multiplexer
S2
S1
S0


Nama: Muhammad Rafli Rizkyanto
NPM: 202410715176
Praktikum4
D0
D1
D2
D3
D4
D5
D6
D7
Multiplexer
S2
S1
S0





Tugas Demultiplexer 1-to-8

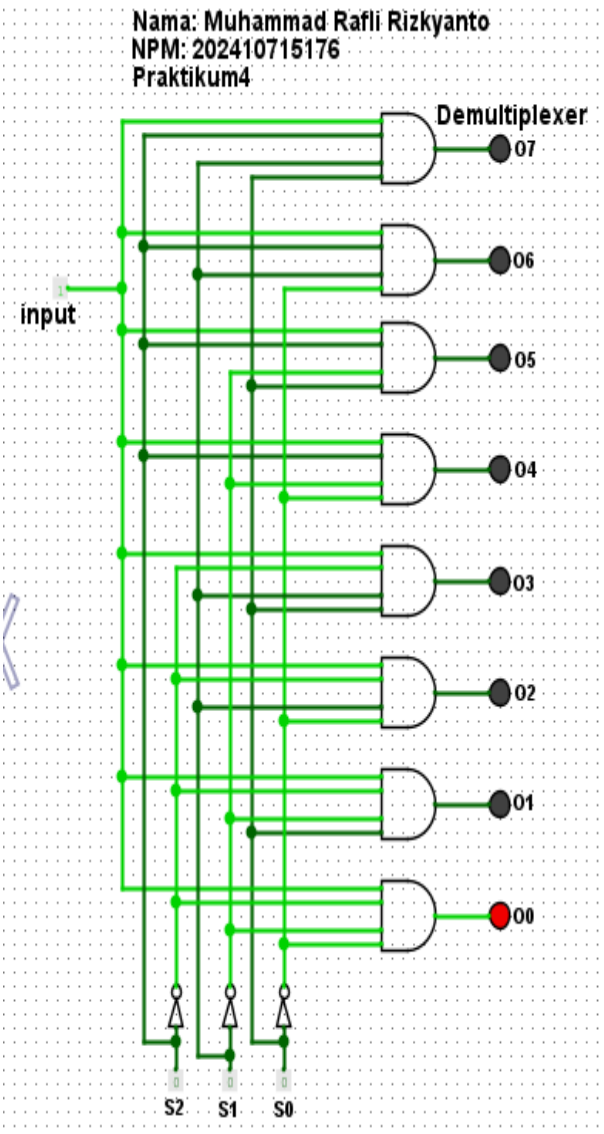
- 1-to-N Demultiplexer: Rangkaian yg memiliki 1 input, $\log_{fo2}(N)\backslash\log\_2(N)\log2(N)$ select lines, dan NNN output.
- Contoh: 1-to-8 Demultiplexer
  - input: 1
  - Select Lines: S0,S1,S2
  - Output: O_0,O_1,O_2,O_3.O_4,O_5,O_6,O_7
- Ekspresi logika output:

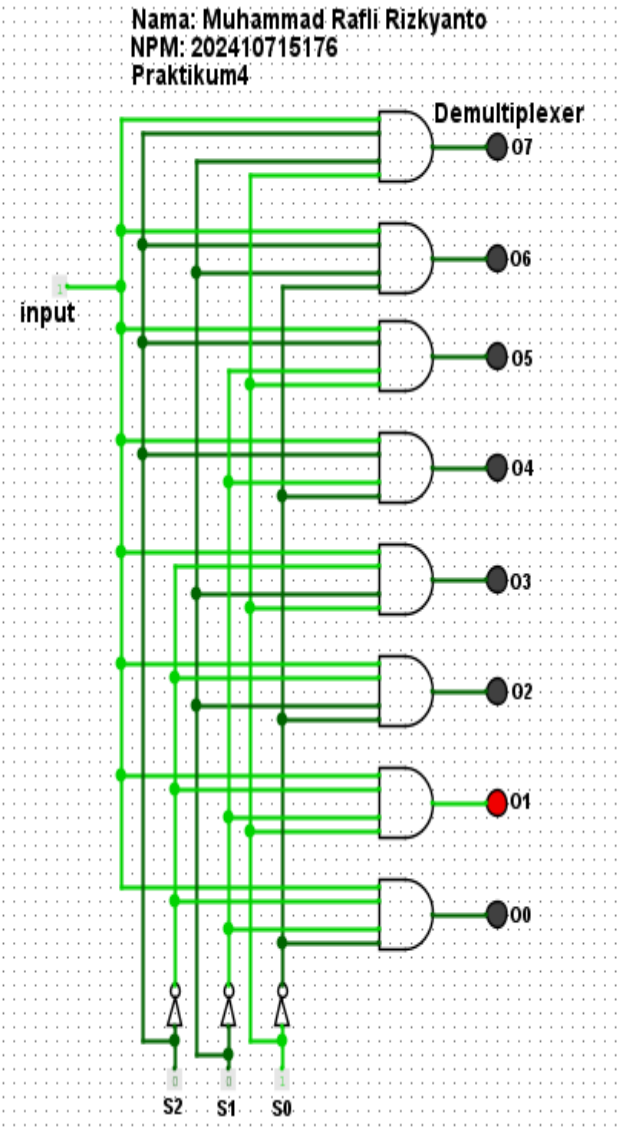
$O_0 = \overline{S2} \cdot \overline{S1} \cdot \overline{S0} \cdot I$
$O_1 = \overline{S1} \cdot \overline{S1} \cdot S0 \cdot I$
$O_2 = \overline{S2} \cdot S1 \cdot \overline{S0} \cdot I$
$O_3 = \overline{S2} \cdot S1 \cdot S0 \cdot I$
$O_4 = S2 \cdot \overline{S1} \cdot \overline{S0} \cdot I$
$O_5 = S2 \cdot \overline{S1} \cdot S0 \cdot I$
$O_6 = S2 \cdot S1 \cdot \overline{S0} \cdot I$
$O_7 = S2 \cdot S1 \cdot S0 \cdot I$

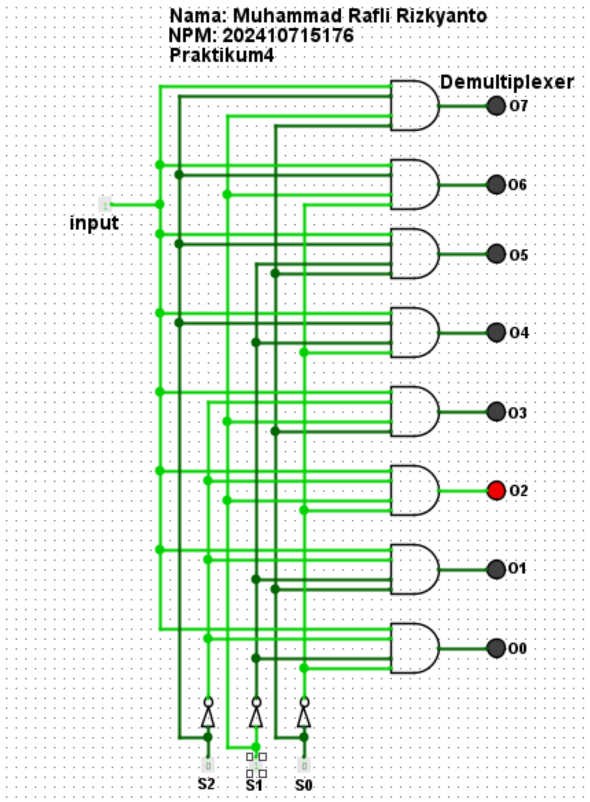
Tabel Kebenaran

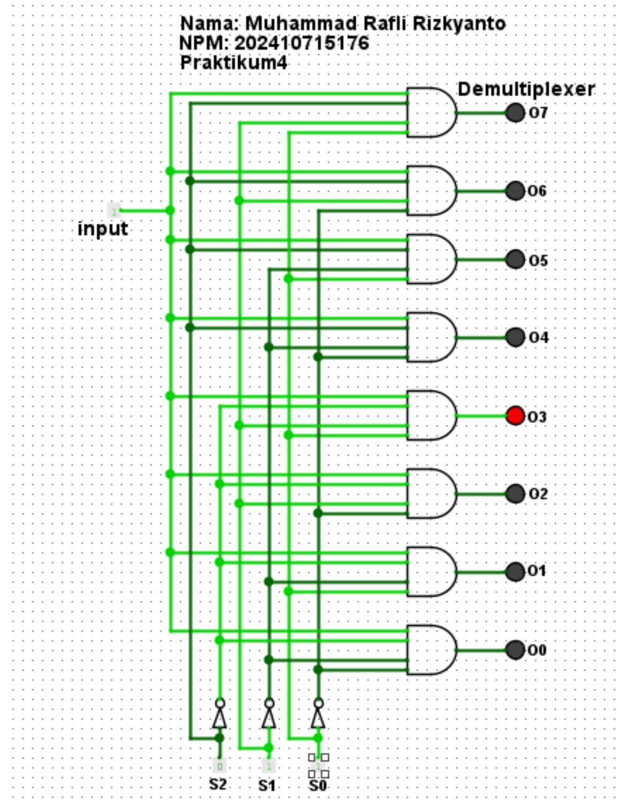
S_2	S_1	S_0	Output O_0	Output O_1	Output O_2	Output O_3	Output O_4	Output O_5	Output O_6	Outrput O_7
0	0	0	1	0	0	0	0	0	0	0
0	0	1	0	1	0	0	0	0	0	0
0	1	0	0	0	1	0	0	0	0	0
0	1	1	0	0	0	1	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0
1	0	1	0	0	0	0	0	1	0	0
1	1	0	0	0	0	0	0	0	1	0
1	1	1	0	0	0	0	0	0	0	1

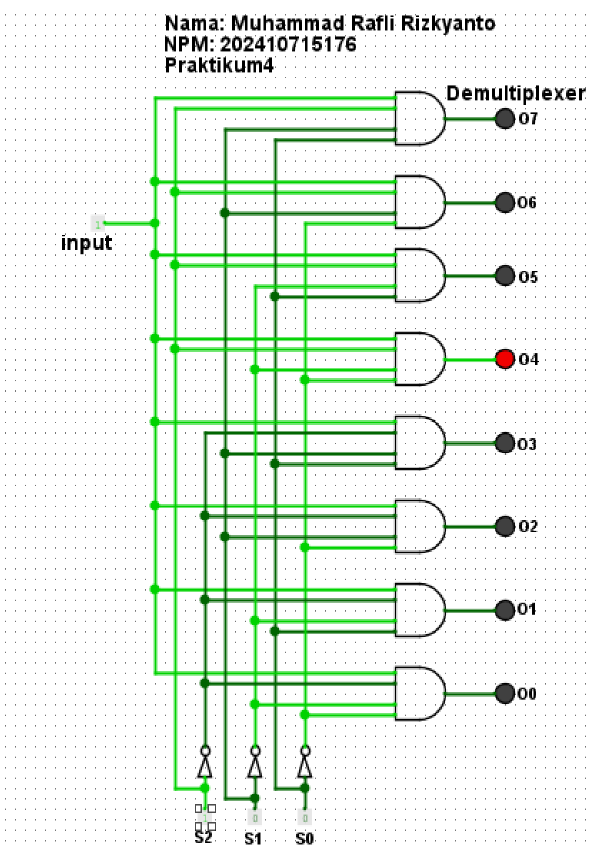
Implementasi di Logisim

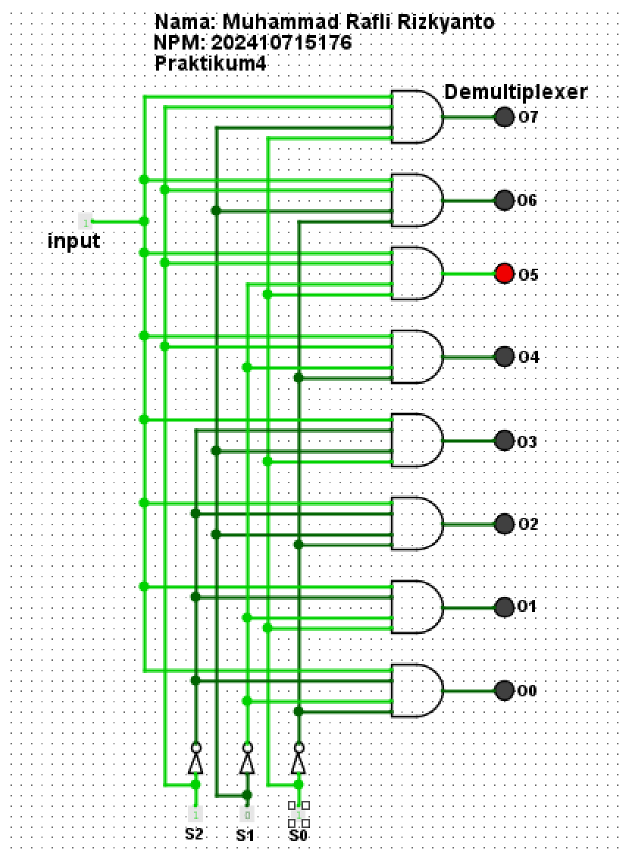


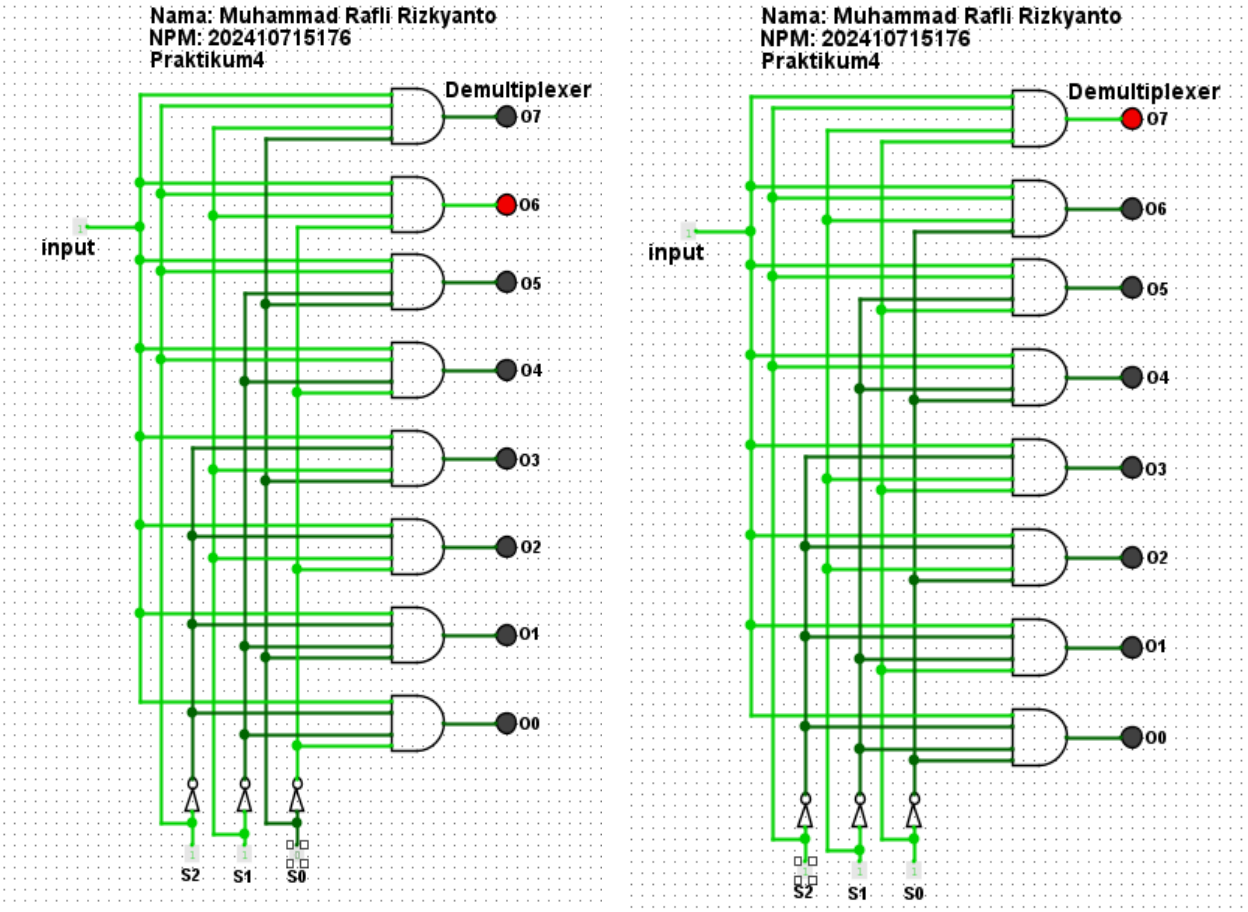



Nama: Muhammad Rafli Rizkyanto
NPM: 202410715176
Praktikum4
Demultiplexer
input
O7
O6
O5
O4
O3
O2
O1
O0
S2
S1
S0

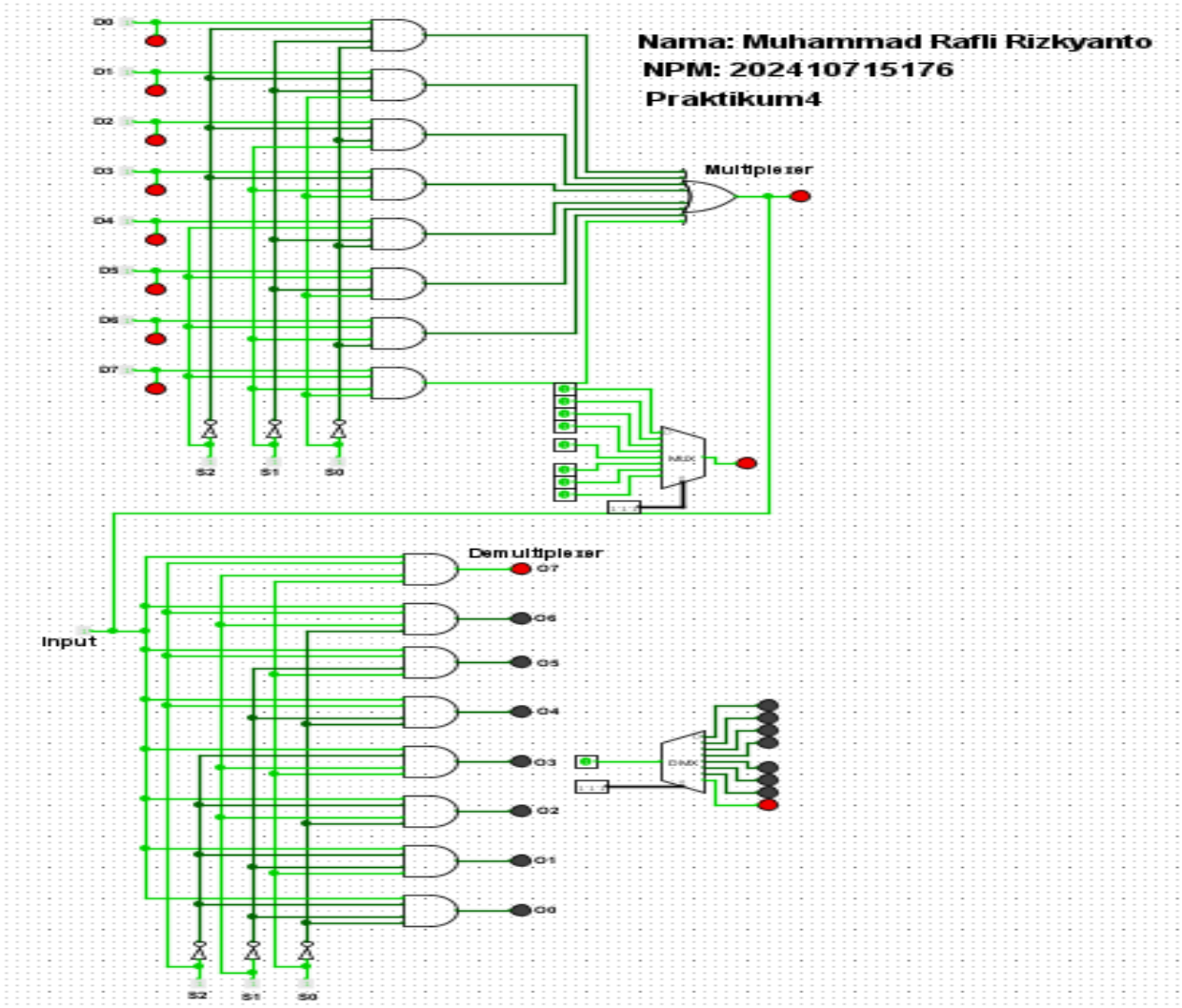

Nama: Muhammad Rafli Rizkyanto
NPM: 202410715176
Praktikum4
Demultiplexer
input
O7
O6
O5
O4
O3
O2
O1
O0
S2
S1
S0


Nama: Muhammad Rafli Rizkyanto
NPM: 202410715176
Praktikum4
Demultiplexer
input
O7
O6
O5
O4
O3
O2
O1
O0
S2
S1
S0


Nama: Muhammad Rafli Rizkyanto
NPM: 202410715176
Praktikum4
Demultiplexer
input
O7
O6
O5
O4
O3
O2
O1
O0
S2
S1
S0



Implementasi Gabungan Multiplexer-Demultiplexer



Kesimpulan

Dari praktikum ini saya bisa memahami bagaimana MUX dan DEMUX bekerja, terutama dalam memilih dan mengarahkan data berdasarkan sinyal selektor. Melalui simulasi di Logisim, rangkaian yang dibuat dapat berjalan sesuai tabel kebenaran. Praktikum ini membantu saya lebih paham konsep dasar sistem digital, khususnya proses pemilihan input pada MUX dan pembagian output pada DEMUX.