WonBin Seo

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ECE 813 Advanced VLSI Design
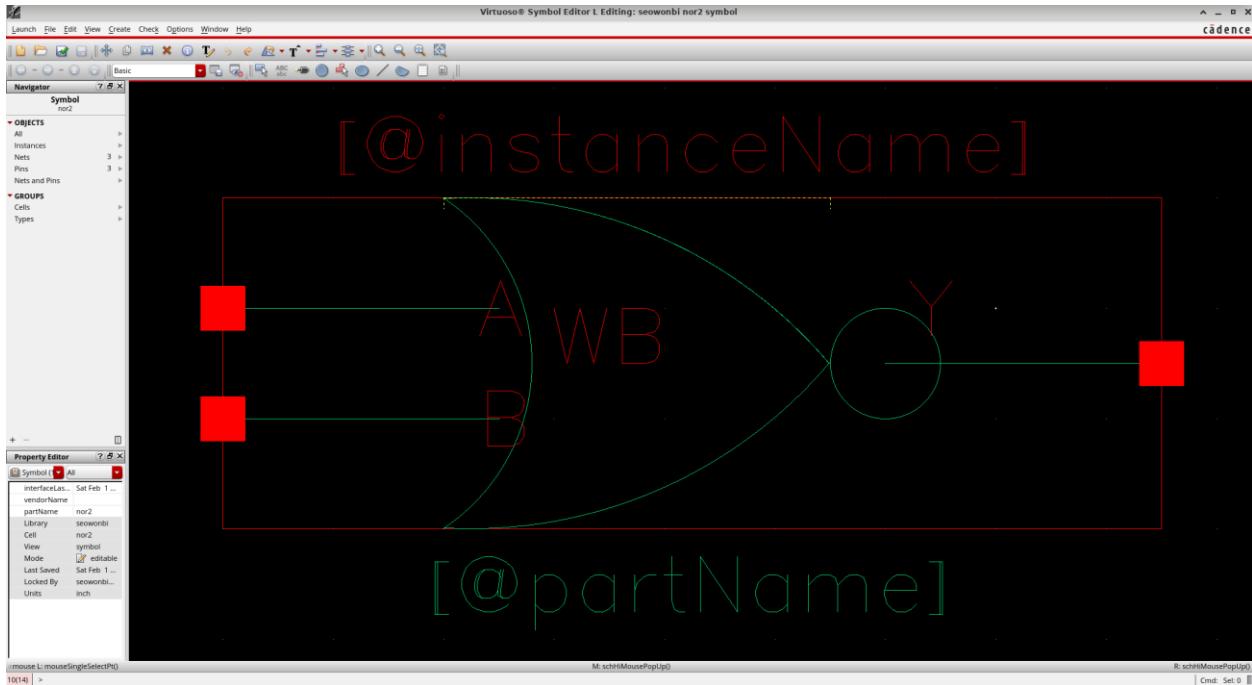
19 February 2025

Exam1
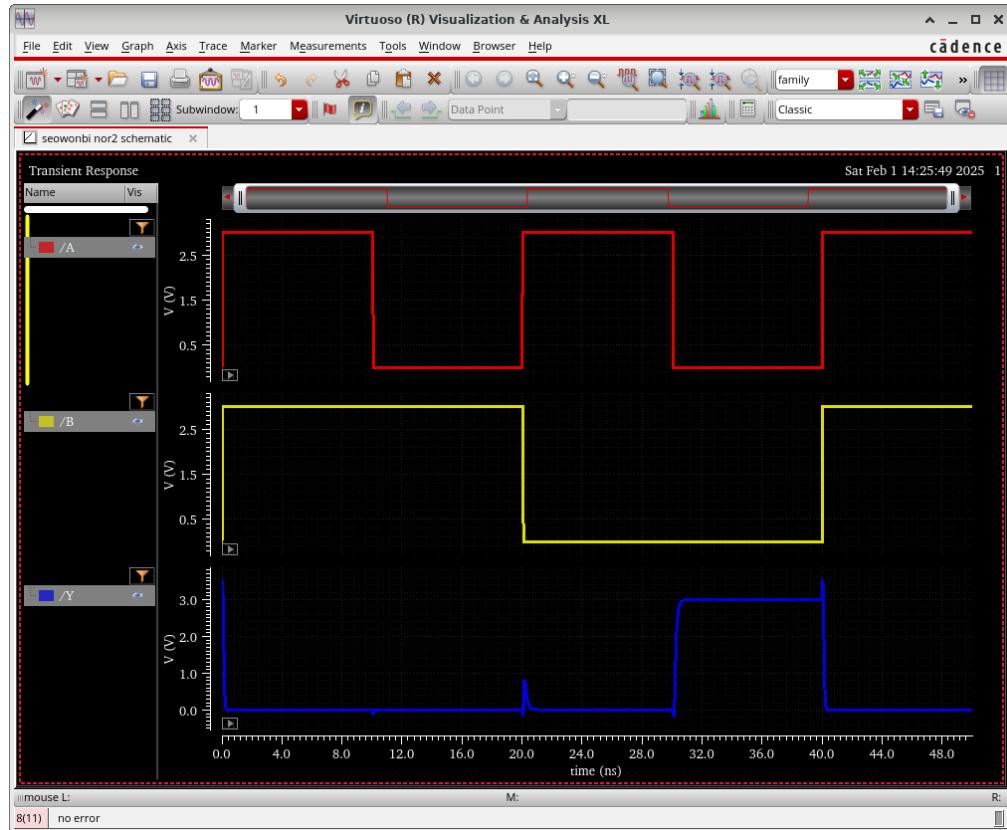
Problem 1 – NOR2 Schematic
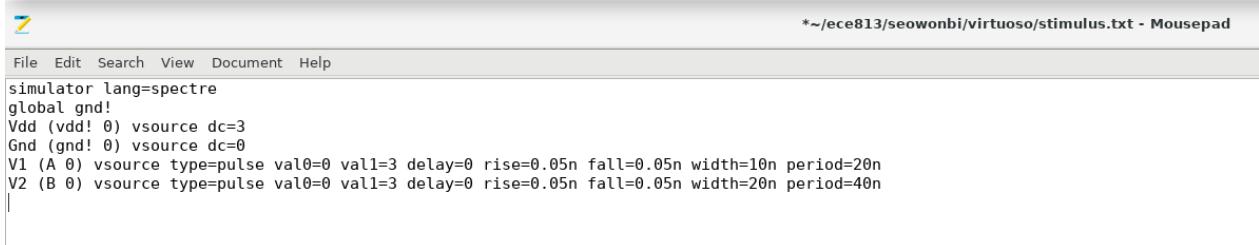
Problem 2 – NOR2 Symbol

Problem 3 – NOR2 Simulation

Problem 3 – NOR2 Stimulus File
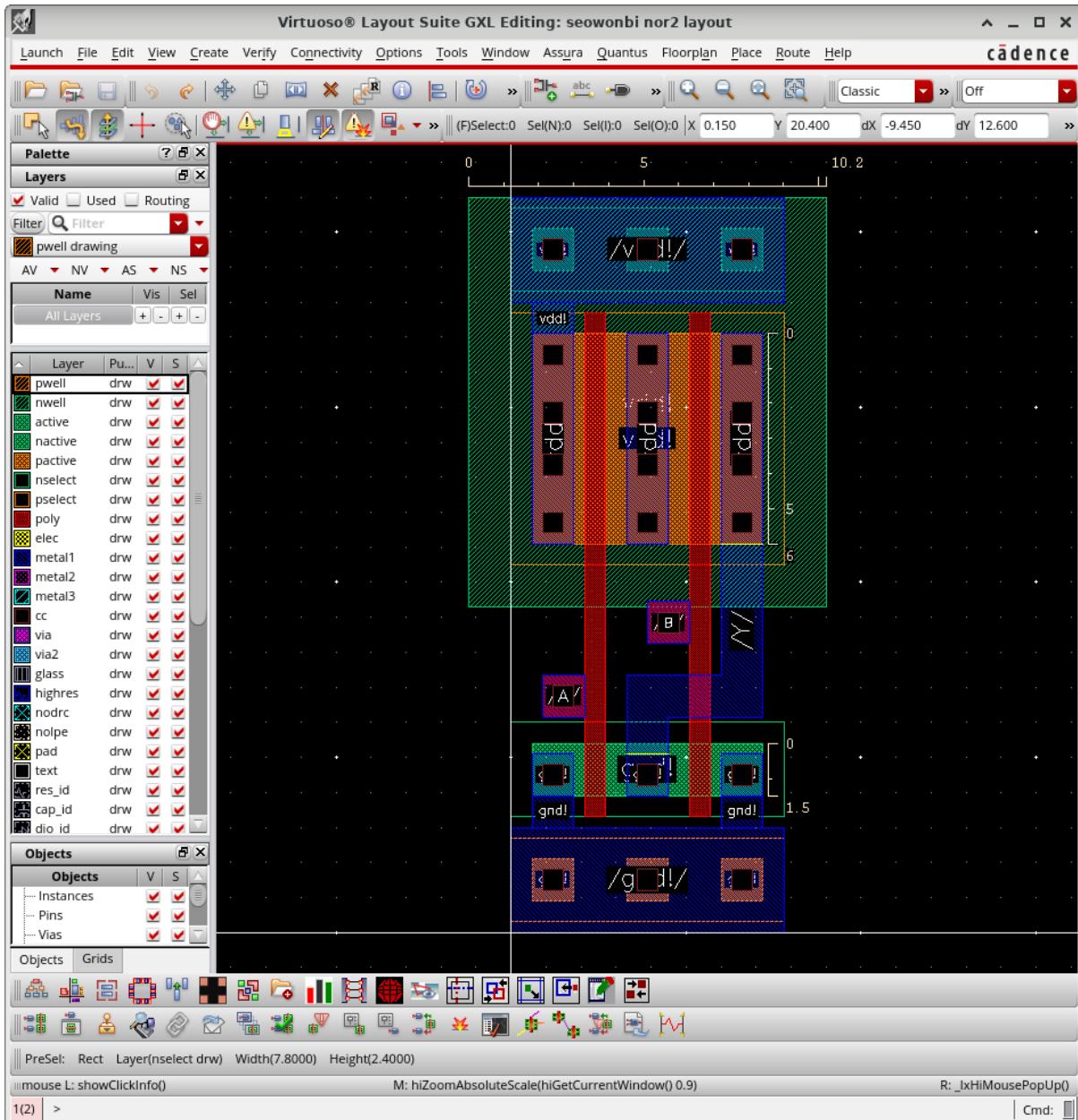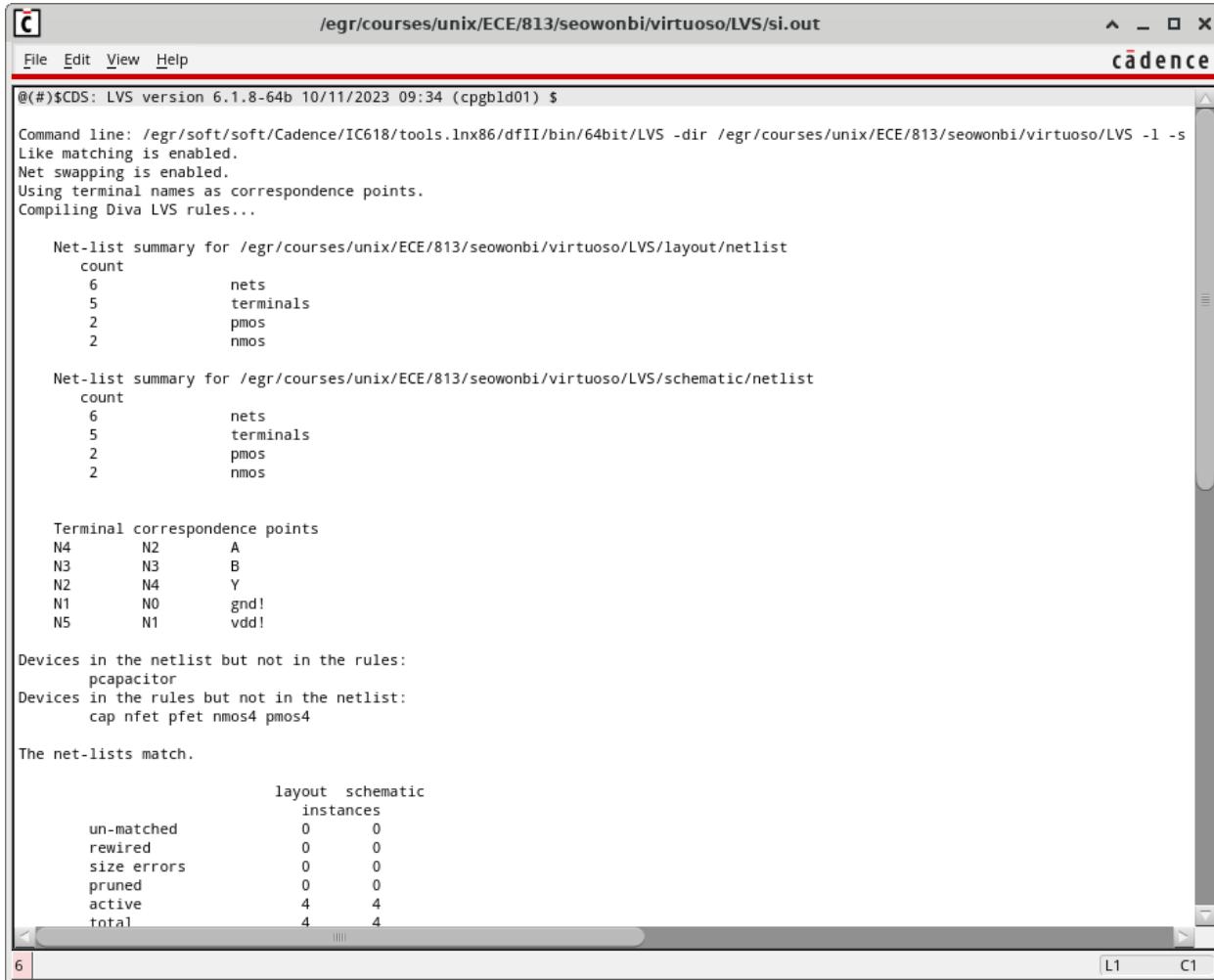
```
simulator lang=spectre
global gnd!
Vdd (vdd! 0) vsource dc=3
Gnd (gnd! 0) vsource dc=0
V1 (A 0) vsource type=pulse val0=0 val1=3 delay=0 rise=0.05n fall=0.05n width=10n period=20n
V2 (B 0) vsource type=pulse val0=0 val1=3 delay=0 rise=0.05n fall=0.05n width=20n period=40n
```

Problem 4 – NOR2 Layout

Problem 5 – NOR2 LVS

```
/egr/courses/unix/ECE/813/seowonbi/virtuoso/LVS/si.out                    ^ _ □ X

File  Edit  View  Help                                                    cādence

@(#)$CDS: LVS version 6.1.8-64b 10/11/2023 09:34 (cpgb1d01) $

Command line: /egr/soft/soft/Cadence/IC618/tools.lnx86/dfII/bin/64bit/LVS -dir /egr/courses/unix/ECE/813/seowonbi/virtuoso/LVS -l -s
Like matching is enabled.
Net swapping is enabled.
Using terminal names as correspondence points.
Compiling Diva LVS rules...

    Net-list summary for /egr/courses/unix/ECE/813/seowonbi/virtuoso/LVS/layout/netlist
        count
        6               nets
        5               terminals
        2               pmos
        2               nmos

    Net-list summary for /egr/courses/unix/ECE/813/seowonbi/virtuoso/LVS/schematic/netlist
        count
        6               nets
        5               terminals
        2               pmos
        2               nmos


    Terminal correspondence points
    N4          N2          A
    N3          N3          B
    N2          N4          Y
    N1          N0          gnd!
    N5          N1          vdd!

Devices in the netlist but not in the rules:
        pcapacitor
Devices in the rules but not in the netlist:
        cap nfet pfet nmos4 pmos4

The net-lists match.

                            layout  schematic
                            instances
        un-matched          0       0
        rewired             0       0
        size errors         0       0
        pruned              0       0
        active              4       4
        total               4       4

6                                                               L1          C1
```
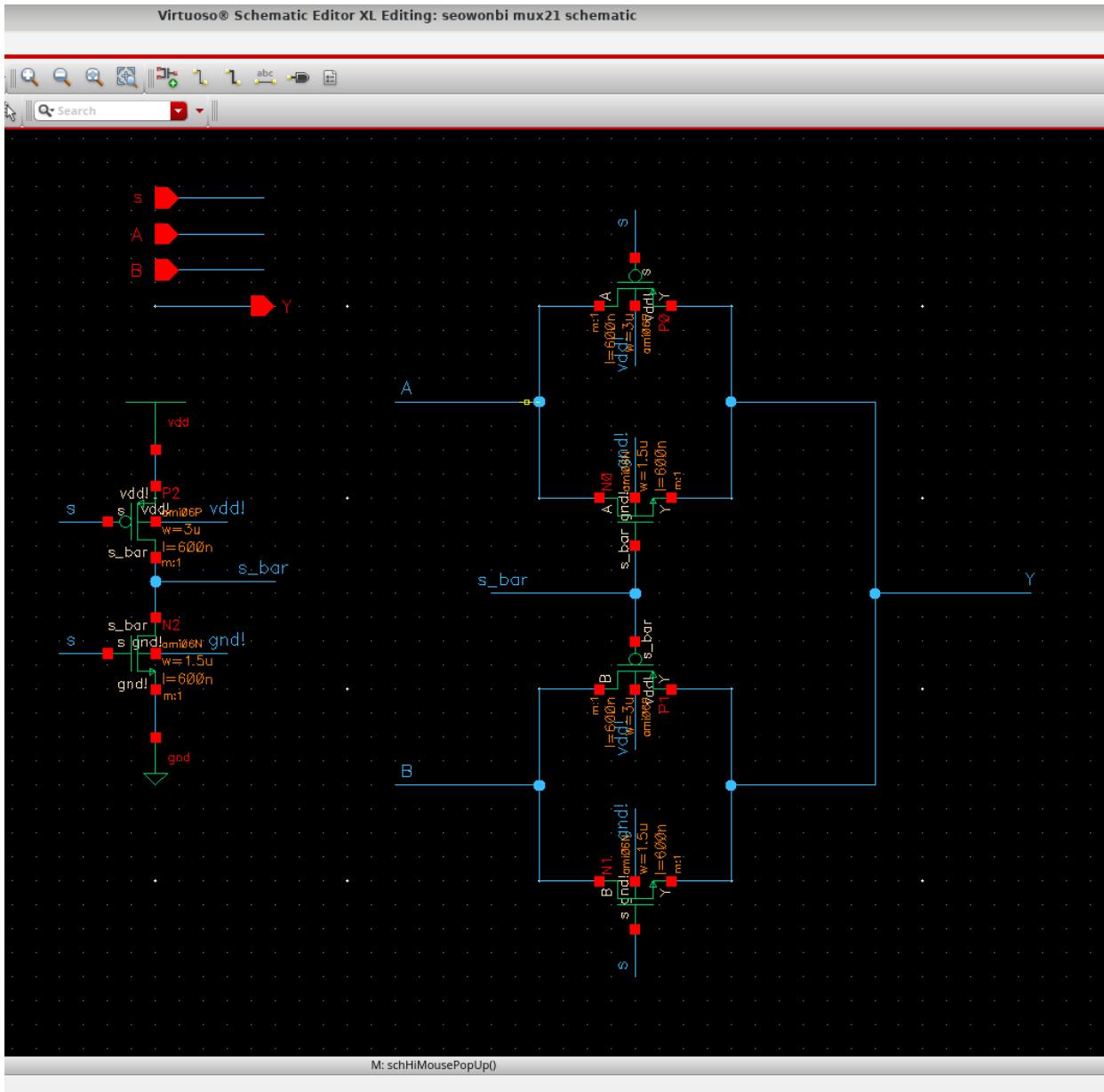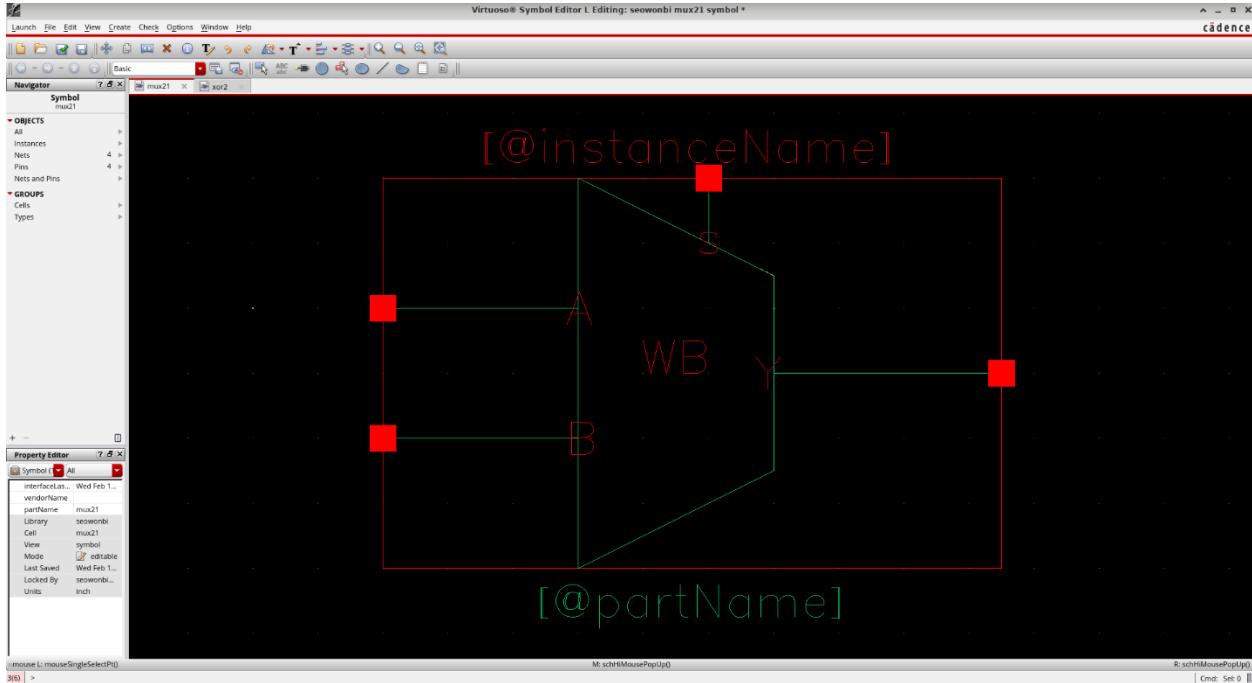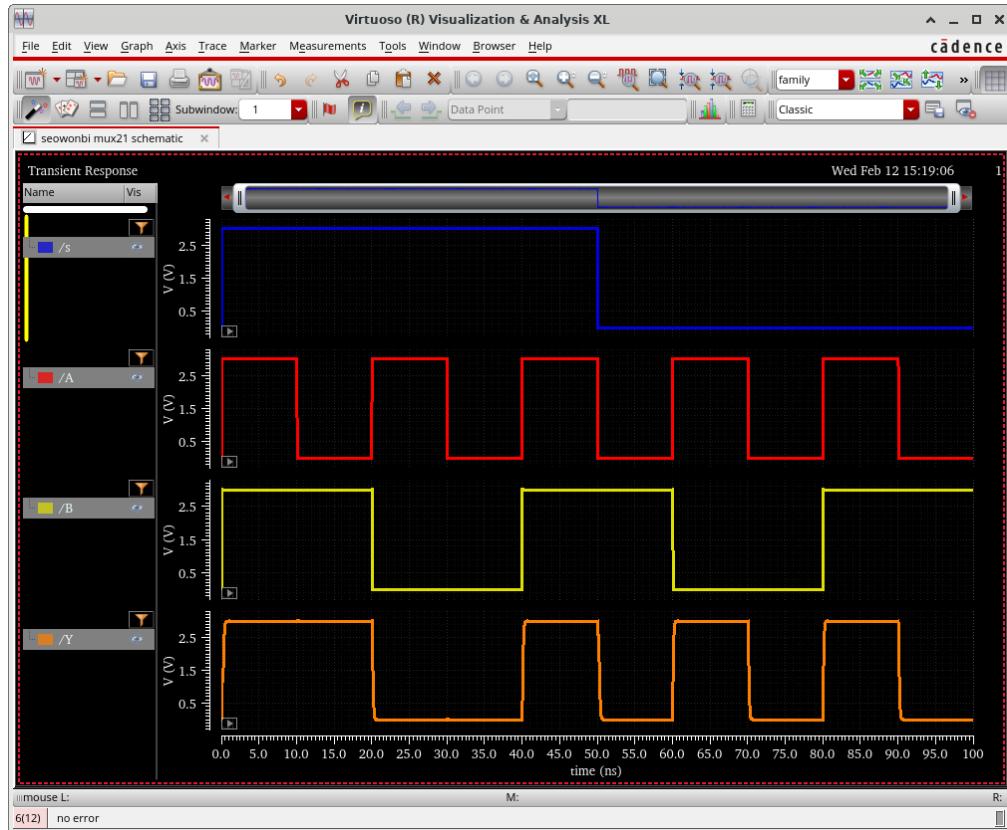
Problem 6 – MUX21 Schematic
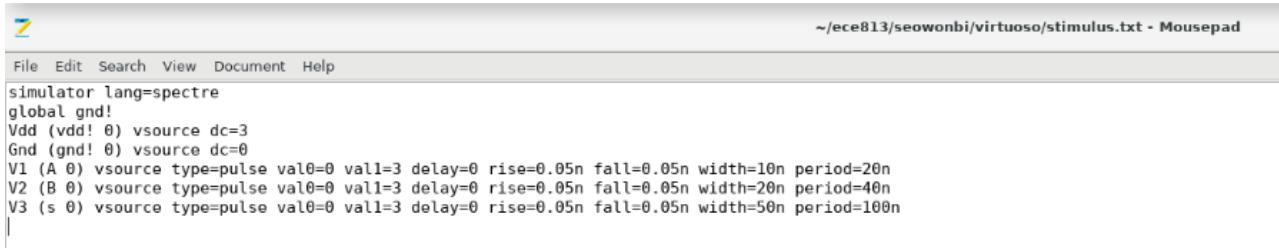
Problem 7 – MUX21 Symbol

Problem 8 – MUX21 Simulation

Problem 8 – MUX21 Stimulus File
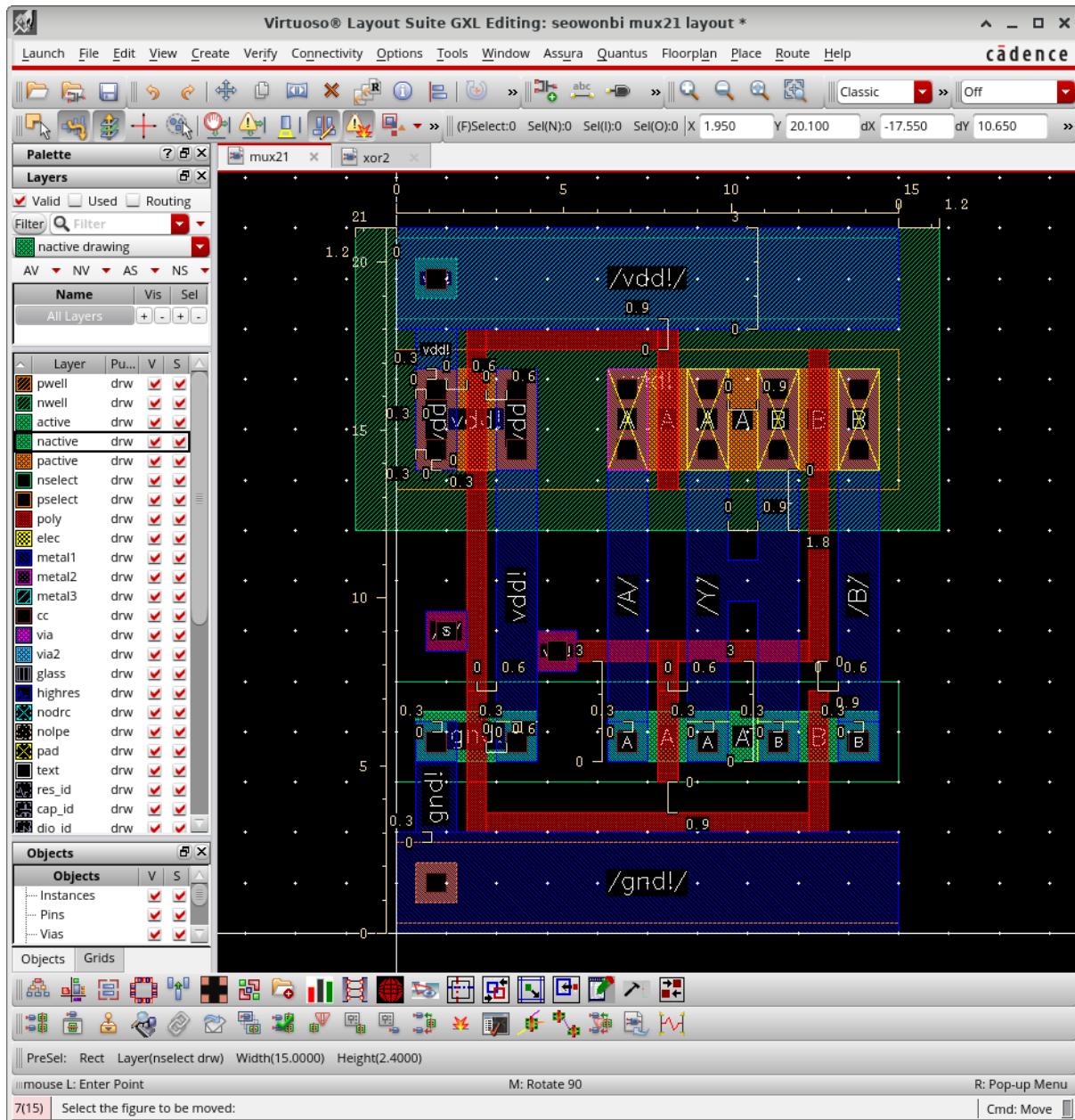

```
simulator lang=spectre
global gnd!
Vdd (vdd! 0) vsource dc=3
Gnd (gnd! 0) vsource dc=0
V1 (A 0) vsource type=pulse val0=0 val1=3 delay=0 rise=0.05n fall=0.05n width=10n period=20n
V2 (B 0) vsource type=pulse val0=0 val1=3 delay=0 rise=0.05n fall=0.05n width=20n period=40n
V3 (s 0) vsource type=pulse val0=0 val1=3 delay=0 rise=0.05n fall=0.05n width=50n period=100n
```

Problem 9 – MUX21 Layout

Problem 10 – MUX21 LVS

```
┌─c─┬──────────── /egr/courses/unix/ECE/813/seowonbi/virtuoso/LVS/si.out ──────── ^ _ □ ✕ ─┐
│  File  Edit  View  Help                                                          cādence  │
├──────────────────────────────────────────────────────────────────────────────────────────┤
│ @(#)$CDS: LVS version 6.1.8-64b 10/11/2023 09:34 (cpgbld01) $                             │
│                                                                                            │
│ Command line: /egr/soft/soft/Cadence/IC618/tools.lnx86/dfII/bin/64bit/LVS -dir /egr/courses/unix/ECE/813/seowonbi/virtuoso/LVS -l -s -t /egr│
│ Like matching is enabled.                                                                  │
│ Net swapping is enabled.                                                                   │
│ Using terminal names as correspondence points.                                            │
│ Compiling Diva LVS rules...                                                                │
│                                                                                            │
│     Net-list summary for /egr/courses/unix/ECE/813/seowonbi/virtuoso/LVS/layout/netlist    │
│         count                                                                              │
│           7              nets                                                              │
│           6              terminals                                                         │
│           3              pmos                                                              │
│           3              nmos                                                              │
│                                                                                            │
│     Net-list summary for /egr/courses/unix/ECE/813/seowonbi/virtuoso/LVS/schematic/netlist │
│         count                                                                              │
│           7              nets                                                              │
│           6              terminals                                                         │
│           3              pmos                                                              │
│           3              nmos                                                              │
│                                                                                            │
│                                                                                            │
│     Terminal correspondence points                                                        │
│     N4        N2        A                                                                  │
│     N3        N3        B                                                                  │
│     N2        N4        Y                                                                  │
│     N1        N0        gnd!                                                               │
│     N6        N6        s                                                                  │
│     N5        N1        vdd!                                                               │
│                                                                                            │
│ Devices in the netlist but not in the rules:                                              │
│         pcapacitor                                                                         │
│ Devices in the rules but not in the netlist:                                              │
│         cap nfet pfet nmos4 pmos4                                                          │
│                                                                                            │
│ The net-lists match.                                                                       │
│                                                                                            │
│                                layout   schematic                                          │
│                                  instances                                                 │
│             un-matched           0         0                                              │
│             rewired              0         0                                              │
│             size errors          0         0                                              │
│             pruned               0         0                                              │
│             active               6         6                                              │
│             total                6         6                                              │
│                                                                                            │
│                                    nets                                                    │
│             un-matched           0         0                                              │
│             merged               0         0                                              │
│             pruned               0         0                                              │
│             active               7         7                                              │
│             total                7         7                                              │
├──────────────────────────────────────────────────────────────────────────────────────────┤
│ 20                                                                              L1      C1 │
└──────────────────────────────────────────────────────────────────────────────────────────┘
```
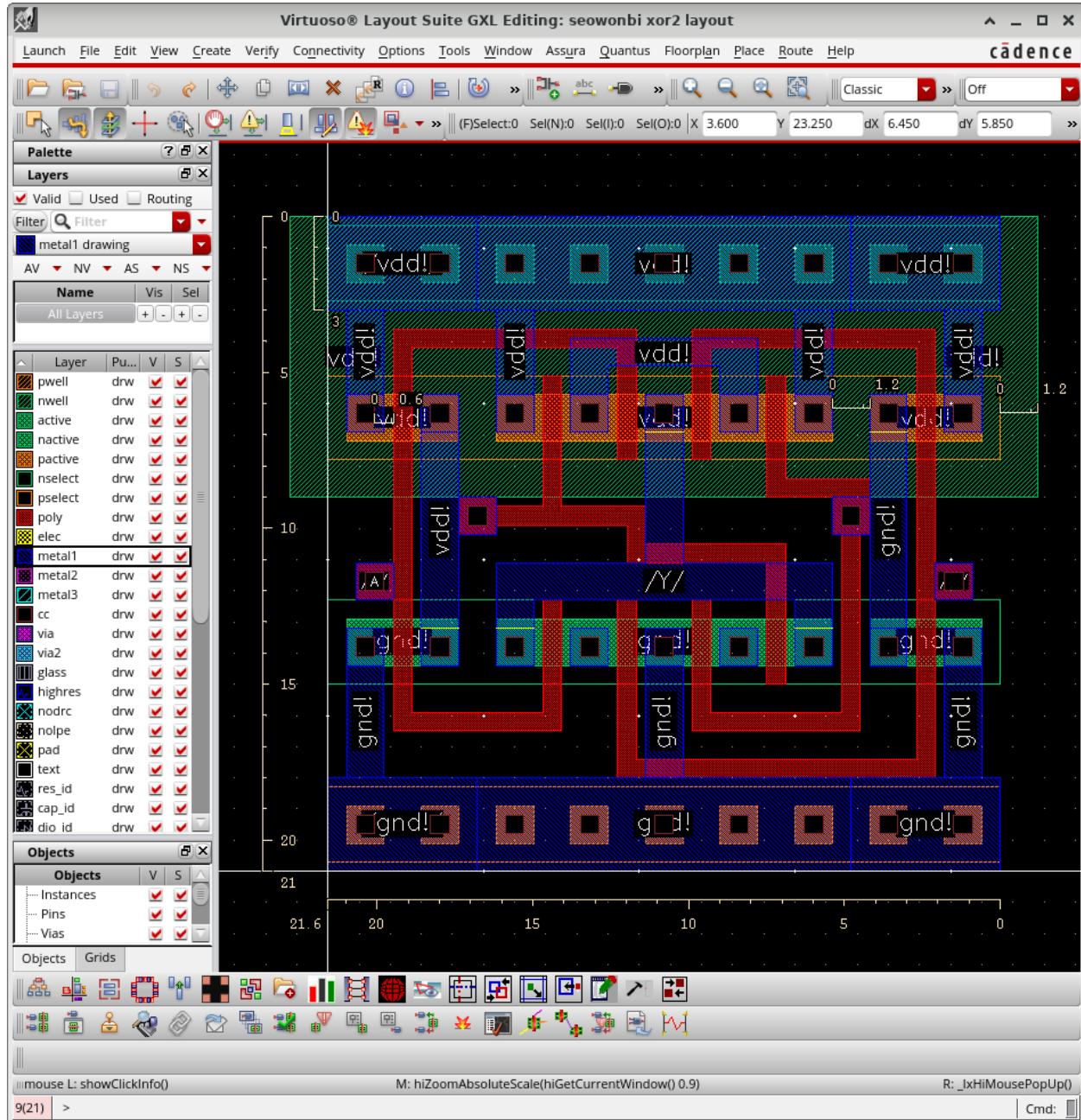
Problem 11 – XOR2 Layout

Problem 12 – XOR2 LVS

```
@(#)$CDS: LVS version 6.1.8-64b 10/11/2023 09:34 (cpgbld01) $

Command line: /egr/soft/soft/Cadence/IC618/tools.lnx86/dfII/bin/64bit/LVS -dir /egr/courses/unix/ECE/813/seowonbi/vir
Like matching is enabled.
Net swapping is enabled.
Using terminal names as correspondence points.
Compiling Diva LVS rules...

    Net-list summary for /egr/courses/unix/ECE/813/seowonbi/virtuoso/LVS/layout/netlist
        count
        10              nets
        5               terminals
        6               pmos
        6               nmos

    Net-list summary for /egr/courses/unix/ECE/813/seowonbi/virtuoso/LVS/schematic/netlist
        count
        10              nets
        5               terminals
        6               pmos
        6               nmos


    Terminal correspondence points
    N8         N4         A
    N7         N3         B
    N6         N2         Y
    N5         N1         gnd!
    N9         N0         vdd!

Devices in the netlist but not in the rules:
        pcapacitor
Devices in the rules but not in the netlist:
        cap nfet pfet nmos4 pmos4

The net-lists match.

                              layout   schematic
                                instances
        un-matched            0         0
        rewired               0         0
        size errors           0         0
        pruned                0         0
        active                12        12
        total                 12        12

                                nets
        un-matched            0         0
        merged                0         0
        pruned                0         0
        active                10        10
        total                 10        10

                              terminals
        un-matched            0         0
        matched but
        different type        0         0
        total                 5         5


Probe files from /egr/courses/unix/ECE/813/seowonbi/virtuoso/LVS/schematic

devbad.out:

netbad.out:

mergenet.out:

termbad.out:
```

21