課題9-1

実行予想

```
1100
0010
0101
0010
1
1110
1000
0
0
01110101
0101
```

実行結果

```
1) 1100
2) 0010
3) 0101
4) 0010
5) 1
6) 1110
7) 1000
8) 0
9) 0
10) 01110101
11) 0101
```

課題9-5(1)

プログラム

mux.v

```
module mux (
    input a, b, s,
    output y
);
assign y = s ? b : a;
endmodule
```

main.v

```
`timescale 1ns/1ns
module mux_test;
    reg a, b, s;
    wire y;
    mux f(a, b, s, y);

    initial begin
        a = 0; b = 0; s = 0;
        $dumpfile("main.vcd");
        $dumpvars(0, mux_test);
        $monitor("a=%b b=%b s=%b y=%b", a, b, s, y);

        // Test cases
        a = 0; b = 0; s = 0; #10;
        a = 0; b = 1; s = 0; #10;
        a = 1; b = 0; s = 0; #10;
        a = 1; b = 1; s = 0; #10;
        a = 0; b = 0; s = 1; #10;
        a = 0; b = 1; s = 1; #10;
        a = 1; b = 0; s = 1; #10;
        a = 1; b = 1; s = 1; #10;
        $finish;
    end
endmodule
```

タイムチャート

波形

課題9-5(2)

プログラム

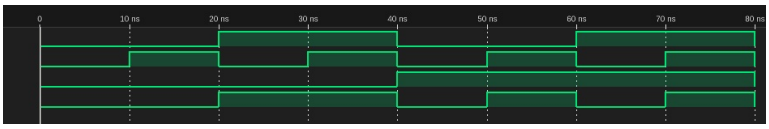
circuit.v

```
module my_mux (
    input a, b, s,
    output y
);
    wire sel_bar;
    wire a_and, b_and;

    not (sel_bar, s);
    and (a_and, a, sel_bar);
    and (b_and, b, s);
    or  (y, a_and, b_and);
endmodule
```

main.v

```
`timescale 1ns/1ns
module my_mux_test;
    reg a, b, s;
    wire y;
    my_mux f(a, b, s, y);

    initial begin
        a = 0; b = 0; s = 0;
        $dumpfile("main.vcd");
        $dumpvars(0, my_mux_test);
        $monitor("a=%b b=%b s=%b y=%b", a, b, s, y);

        // Test cases
        a = 0; b = 0; s = 0; #10;
        a = 0; b = 1; s = 0; #10;
        a = 1; b = 0; s = 0; #10;
        a = 1; b = 1; s = 0; #10;
        a = 0; b = 0; s = 1; #10;
        a = 0; b = 1; s = 1; #10;
        a = 1; b = 0; s = 1; #10;
        a = 1; b = 1; s = 1; #10;
        $finish;
    end
endmodule
```

タイムチャート



波形

課題9-6(1)

プログラム

circuit.v

```
module kadai09_6 (
    input [1:0] a,
    input [1:0] b,
    output [3:0] z
);

    assign z = {a, b};

endmodule
```

出力

```
VCD info: dumpfile kadai09_6_test.vcd opened for output.
                   0: a = 00, b = 00, z = 0000
                  10: a = 01, b = 00, z = 0100
                  20: a = 10, b = 00, z = 1000
                  30: a = 11, b = 00, z = 1100
                  40: a = 00, b = 01, z = 0001
                  50: a = 01, b = 01, z = 0101
                  60: a = 10, b = 01, z = 1001
                  70: a = 11, b = 01, z = 1101
                  80: a = 00, b = 10, z = 0010
                  90: a = 01, b = 10, z = 0110
                 100: a = 10, b = 10, z = 1010
                 110: a = 11, b = 10, z = 1110
                 120: a = 00, b = 11, z = 0011
                 130: a = 01, b = 11, z = 0111
                 140: a = 10, b = 11, z = 1011
                 150: a = 11, b = 11, z = 1111
```

タイムチャート

波形

課題9-6(2)

プログラム

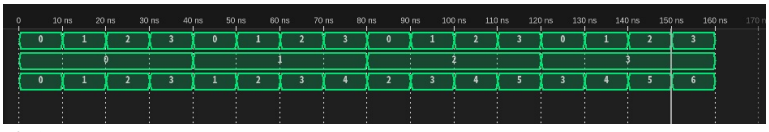
circuit.v

```
module kadai09_6 (
    input [1:0] a,
    input [1:0] b,
    output [3:0] z
);

    assign z = {2'b00, a} + {2'b00, b};

endmodule
```

出力

```
VCD info: dumpfile kadai09_6_test.vcd opened for output.
                   0: a = 00, b = 00, z = 0000
                  10: a = 01, b = 00, z = 0100
                  20: a = 10, b = 00, z = 1000
                  30: a = 11, b = 00, z = 1100
                  40: a = 00, b = 01, z = 0001
                  50: a = 01, b = 01, z = 0101
                  60: a = 10, b = 01, z = 1001
                  70: a = 11, b = 01, z = 1101
                  80: a = 00, b = 10, z = 0010
                  90: a = 01, b = 10, z = 0110
                 100: a = 10, b = 10, z = 1010
                 110: a = 11, b = 10, z = 1110
                 120: a = 00, b = 11, z = 0011
                 130: a = 01, b = 11, z = 0111
                 140: a = 10, b = 11, z = 1011
                 150: a = 11, b = 11, z = 1111
```

タイムチャート



波形