

INDIAN INSTITUTE OF TECHNOLOGY PATNA

CS226- Switching Theory Lab

Lab 2: Logic simulation Sub-blocks

Assignment:

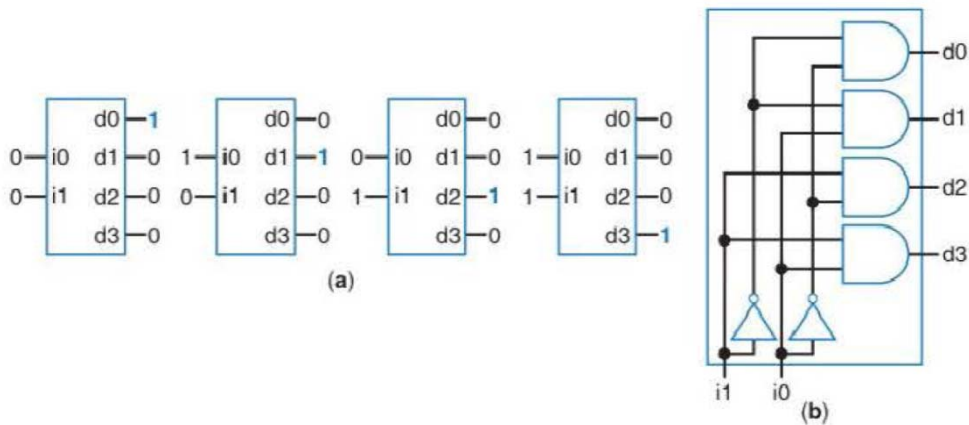
(Design and simulate)

In this lab, you will begin to familiarise yourself with some standard blocks. This will help you learn more about logic, and build the fundamental components used in various architectures.

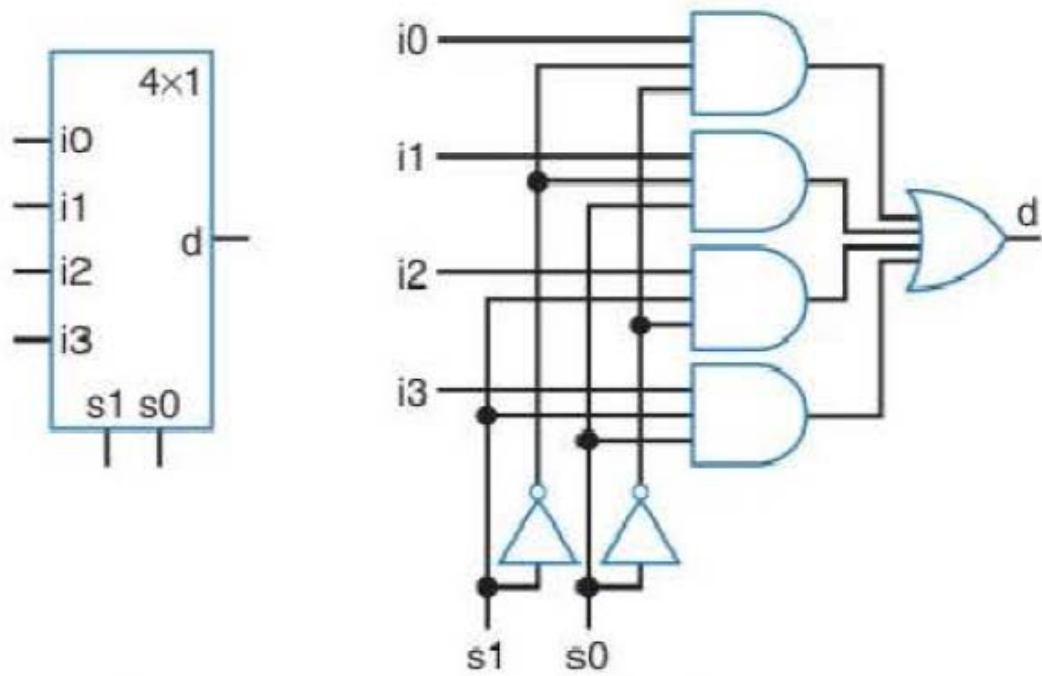
Assignment:

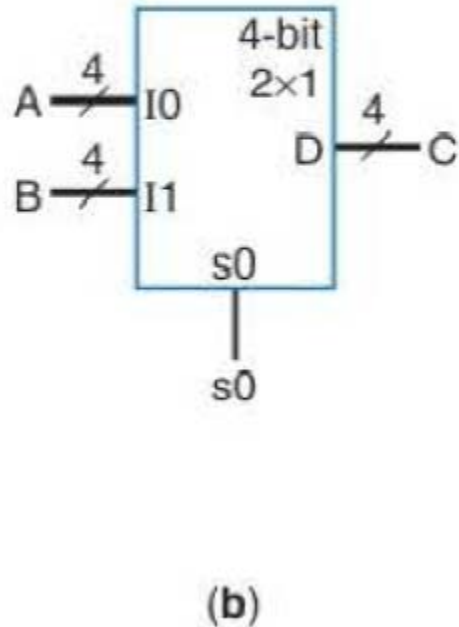
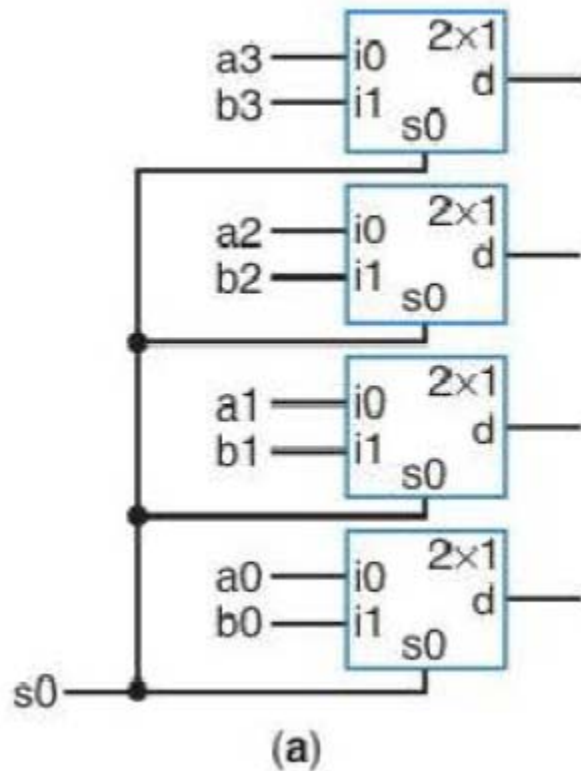
P1: Implement the function $Y = wx'y' + yw'z' + yxz + yxw$ using basic gates

P2: Simulate the following the following (2-4 decoder).



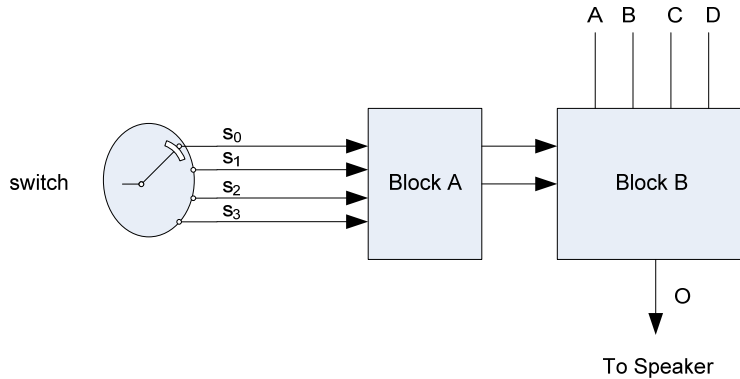
P3: Simulate the following the following (2-4 decoder).





P4:

A home entertainment center has four different audio sources that can be played over the same set of speakers. Each audio source, named A, B, C and D, is connected using a wire on which the digitized audio signal is transmitted. The user selects which audio source is to be played using a rotary switch with four outputs, s_0 , s_1 , s_2 and s_3 , of which exactly one will be '1' at any given time. If $s_0 = '1'$, the audio source A should be played, if $s_1 = '1'$, the audio source B should be played, and so on. Create a digital circuit with a single output O that will output the user's selected audio source. (Hint: A block schematic is shown)



P5: Design a circuit which can select between A or B ; Two 4-bit inputs, A ($a_3 a_2 a_1 a_0$), and B ($b_3 b_2 b_1 b_0$)

P6: Extend P5 for Four numbers (A, B, C and D) .

P7: Design and simulate 8x1 multipliers using AND, OR and NOT gates.

P8: Design and simulate 16x1 multipliers using AND, OR and NOT gates

P9: Design and Simulate a half adder and full adder circuit and extend the circuit that will add two 2-bit binary numbers (use half adder and full adder logic).

Input: $A = a_1 a_0$, $B = b_1 b_0$,

Output: $C S_1 S_0$: sum of inputs

P10: Design a combinational circuit that forms the 2-bit binary sum $S_1 S_0$ of two 2-bit numbers $a_1 a_0$ and $b_1 b_0$. Do not use half adders or full adders.

P11: Implement a full adder using 8:1 Multiplexers.

Submission:

- The simulation files p1.circ, p2.circ, p3.circ, p4.circ, p5.circ, p6.circ... p10.circ, p11.circ
- Zip the above files. Zip; file name is your role number.

Course work submission through:

<https://u.pcloud.com/#page=puplink&code=vfG7Z6S0PMb31qBzaXEbhDLbvhVNIG3Yy>

This work is due on: : 2nd Feb 2021, 11 PM.