

PRACTICE PROBLEMS 1
Lecture 1 - Lecture 2

- Design a circuit that computes $F = 5A$, using the fewest number of 4-bit adders. Input A is a 4-bit number. How many bits are required for the result to avoid overflow?
- Design a 3-bit ALU to perform the operations specified. Draw the internal components and connections within each AL-extender, however you can use a block diagram to depict the adder.

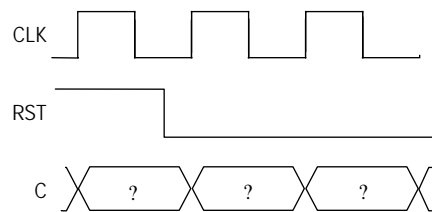
Inputs		Operation
a	b	
0	0	Set output to 2
0	1	A - B
1	0	B + 1
1	1	A + B

- Create the internal design of a full subtractor. Be sure to include a truth table, logic equations, and a gate-level schematic.
- Using only 2-input, 1-output MUXes, implement the following components
 - 8-input, 1 output MUX
 - 2-input AND gate
 - half adder
- Trace the behavior of the Verilog code provided. Fill in the value of C in each time step. (*Hint: run the code through the simulator to verify your result*)

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always @ (posedge RST or posedge CLK) begin
  if( RST == 1 ) begin
    A = 2; B = 4; C = 1;
  end
  else begin
    A <= B;
    B = B + 1;
    C <= A+ B;
  end
end
end

```



- Provide an example/scenario where blocking statements are useful.
- Provide an example/scenario where non-blocking statements are useful.

ECE 574A Questions

8. According to the Mythical Man Month, designer productivity decreases due to team-size complexity. Assuming a hypothetical 6,000,000 transistor project (T), in which a single designer working alone can produce 7,500 transistors per months (P), and each additional designer added to project results in a productivity decrease of 150 transistors per designer (D).
- Derive an equation to compute the months until completion (M) based on T , P , D , and N (team size).
 - Plot the months until completion (M) verses team size (N), with the team size ranging from 1 designer to 50 designers. *Hint: use excel or similar program to plot graph.*
 - Plot the productivity per designer (\mathcal{I}) verses team size (N), with the team size ranging from 1 designer to 50 designers.
 - What is the optimal team size?
 - If $D = 200$, what is the optimal team size?
9. If specifying functionality at a higher level of abstraction increases productivity, what would be the benefit of specifying an module/application at the structural level?