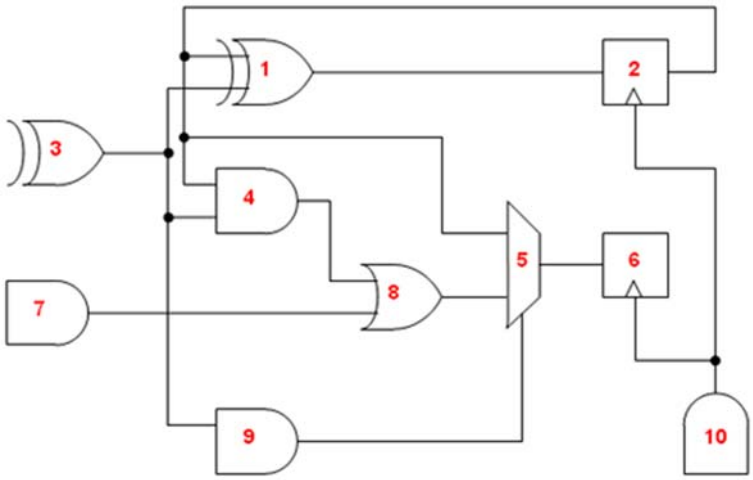
Homework #6

Pull the initial files for this homework into your private git repository by changing into that directory and executing the command "git pull". Create a "solution document" in the *hw06* directory (txt, doc, docx, or pdf) that includes your answers to the problems below. Then add, commit, and push the solution document to your GitHub repository, along with any additional files requested.

1. (20 points) You are given a netlist below with gates numbered for convenience. Add to your solution document your answers to the following questions:
    a. Assuming the 2-way partition A={1,2,3,4,5} B={6,7,8,9,10}, find the cost **T** for this partition.
    b. Using the node weights given below, find the total sizes of partitions A and B. Assuming a maximum partition size of **P** = 48, is this partition admissible?
    c. Now, swap node 2 with nodes 7 & 8 (A={1,3,4,5,7,8} B={2,6,9,10}). Find the gain **g** for this swap. Show your work.
    d. Is the new partition admissible? Show your work.
    e. Find a new partition that has a lower cost than both of the previous partitions that is admissible with **P** = 45. Show your work.



Gate	Weight
AND	5
OR	5
XOR	8
MUX	7
Flip-Flop	19

2. (40 points) Work through the Place & Route Tutorial #1. Commit the files requested on the last page of the tutorial to the *hw06/p2* directory of your *git* repository and push the commit to GitHub. Please do not commit files that were not requested in the tutorial, such as the *counter_routed.enc* file and *counter_routed.enc.dat* subdirectory. Also ensure that your solution document includes a description of the changes that you needed to make to the scripts in order to route the design with no violations.

3. (20 points) Write a python script to generate a MATLAB vector of wire-lengths (in microns) for the nets found in the *FIR_cascade_routed.def* file included with assignment. Then create a histogram of wire-lengths and compute the average length. The output of your script should be called *hw06p3.m* and look something like the following:

```
w = [ ...
length1 ...
length2 ...

...

]
hist(w)
mean(w)
```

Commit your script to the *hw06/p3* directory of your *git* repository and push the commit to GitHub. Ensure that you update the *Makefile* if needed so that your script generates the *hw06p3.m* script automatically with the *make* command. Also, in your solution document, calculate the average wire-length predicted by Donath's method (for values of p=3/4 and p=1/2) and compare to average calculated by your script. For your convenience, the core area is approximately 128 μm x 128 μm.