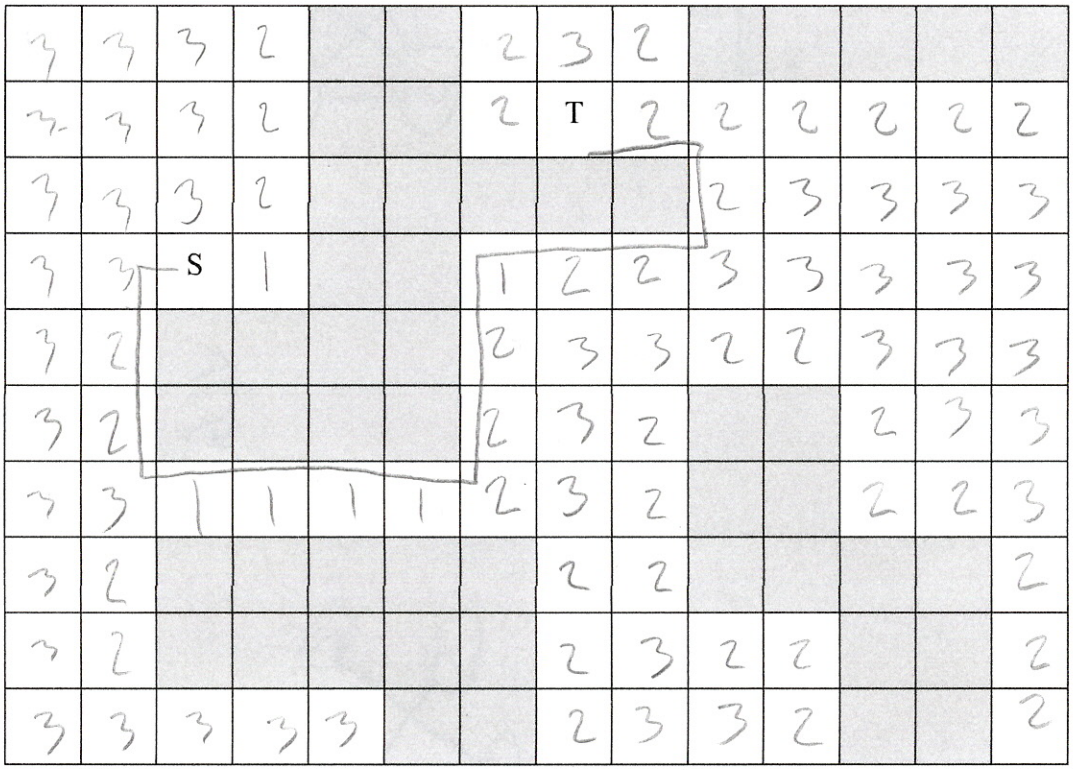
ECE 5460/6460: VLSI Design Automation

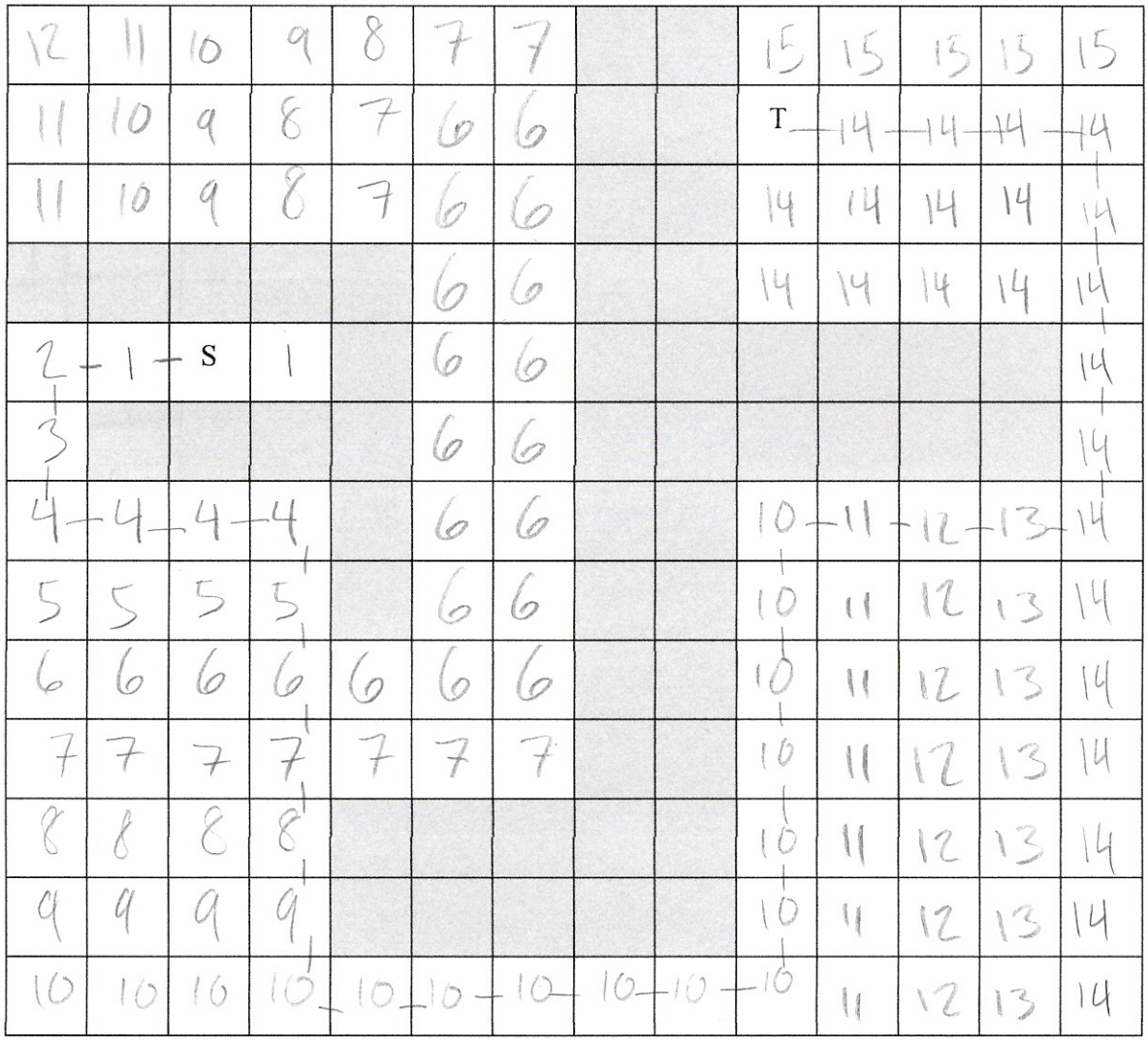
Homework 7
Due: 11/17/2022

PART A

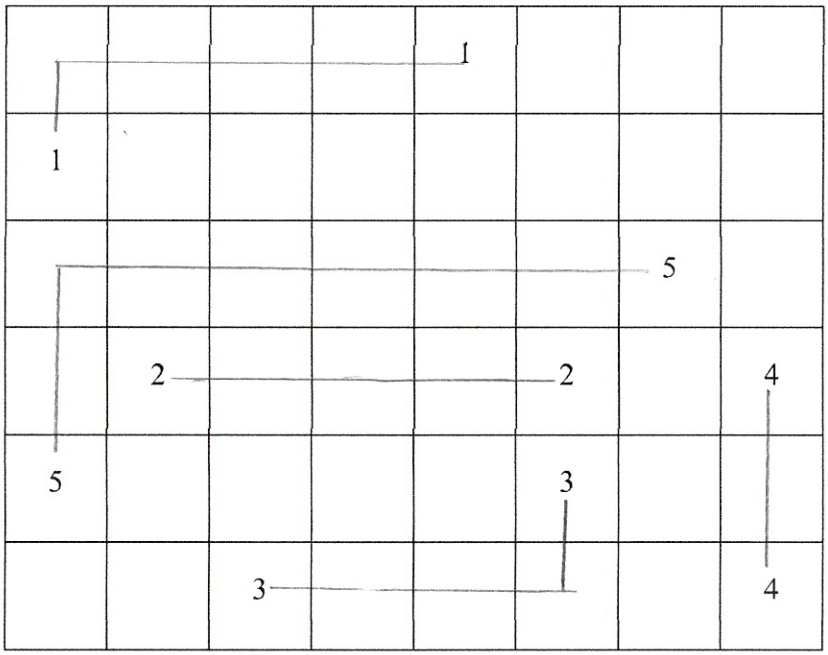
1. (20 points) Fill the grids below with weights equal to the number of usable grid segments as explained in section 5.4.4 in the textbook. Then find the least weighted path between S and T



2. (10 points) Fill the grid of figure below using the technique suggested by"Hadlock" for the minimum detour router.



3. (20 points) Consider the maze routing problem shown below. There are 5 two-terminals are to be routed in the order of 1, 2, 3, 4, and 5. Is it possible to complete the routing? Assume that the router visits adjacent cells are in the order of W, E, N, S.



4. (20 points) Problem 5.5 from textbook.
5. (10 points) Problem 5.21 from textbook.
6. (20 points) Problem 5.22 from textbook.

4) A maze router can be used in multiple layers by either counting 3D movements as one movement or by not counting that up/down movements.

5) $i+j+1$

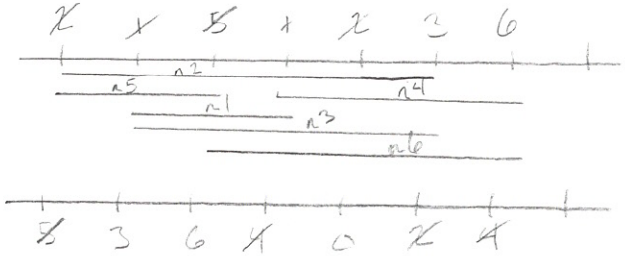
6) maze running:
merit: simpler
drawback: takes a lot of memory

line-search:
merit: less memory
drawback: not always optimal solution

Part B

1)

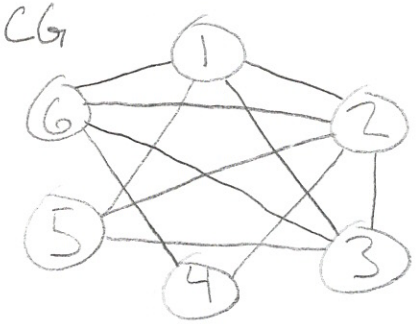
a)



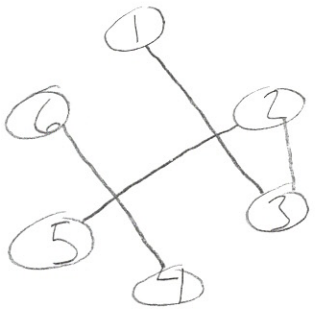
channels = 6

b)

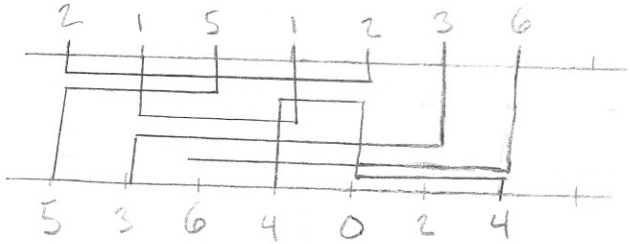
HCG



VCG

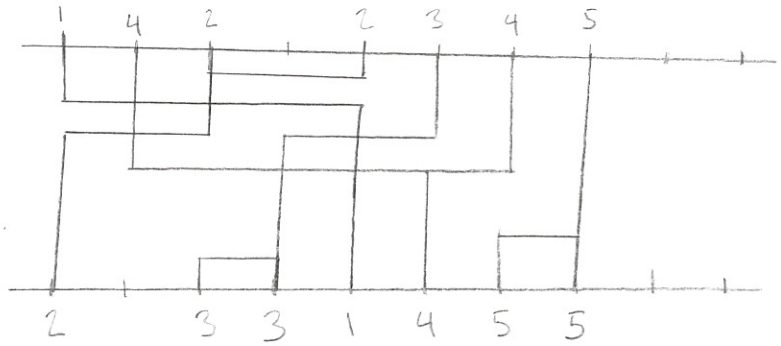


c)



Part B

2)



PART B

1. (20 points) Given the following instance of the channel routing problem
   TOP = [2, 1, 5, 1, 2, 3, 6] and

   BOT = 5, 3, 6, 4, 0, 2, 4]

   (a) (5 points) Determine the maximal sets (S(i)) and find a lower bound on the channel width (Hint: see example 7.1 page 330 in the book)
   (b) (5 points) Draw the HCG and VCG
   (c) (10 points) Apply the constrained left-edge channel router algorithm shown in Figure 7.7, pp. 337 in the textbook to route this channel.
2. (20 points) For the netlist given below find an assignment of nets to tracks to complete routing. Use doglegging to break cycles.
   TOP = [1, 4, 2, 0, 2, 3, 4, 5] and

   BOT = [2, 0, 3, 3, 1, 4, 5, 5]
3. (10 points) Problem 7.7 from the textbook.