## ECE 5460/6460: VLSI Design Automation

## Homework 7 Due: 11/17/2022

## **PART A**

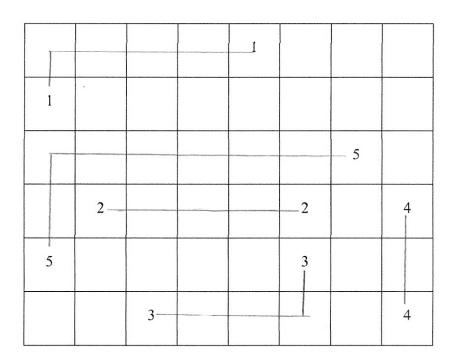
1. (20 points) Fill the grids below with weights equal to the number of usable grid segments as explained in section 5.4.4 in the textbook. Then find the least weighted path between S and T

3	7	3	2		2	3	2					
3-	3	3	2		2	T	2	2	2	2	2	2
3	3	3	2					7	3	3	3	3
3	3	_ S			Concession of Co	2	2	13	3	3	3	3
3	7				12	3	3	2	7	3	3	3
3	2				7	3	2			2	3	3
7	3				12	3	2			2	2	3
3	2					2	2					2
3	2					2	3	2	7			2
3	3	3	3	3		2	3	3	2			2

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

12		10	9	8	7	7			15	15	15	15	15
Contraction of the Contraction o	10	9	8	7	6	6			Т	-14-		14 -	14
Northern Park	10	9	8	7	6	6			Transference	14	1	14	14
					6	6				14	14	14	14
2-	-   -	- S	1		6	6							14
3					6	6							14
4-	-4-	-4-	-4,		6	6			0-	-11-	1	-13-	14
5	5	5	5		6	6			10	( 1	12	13	14
6	6	6	6	6	6	6			0	11	12	13	14
7	7	7	7	7	7	7			10	and the second	17	13	14
8	8	8	8						0	dilegan e-Seaton	12	13	14
9	9	9	9						10	T-manuscript (	12	13	14
10	10	16	16	10-	10-	-10-	- 10-	-10 -	-16	- Carrier	12	13	14

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.



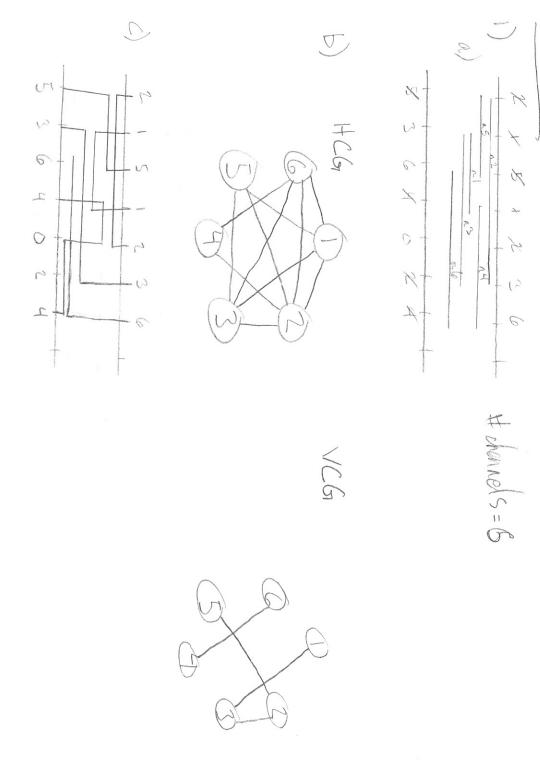
- 4. (20 points) Problem 5.5 from textbook.
- 5. (10 points) Problem 5.21 from textbook.
- 6. (20 points) Problem 5.22 from textbook.

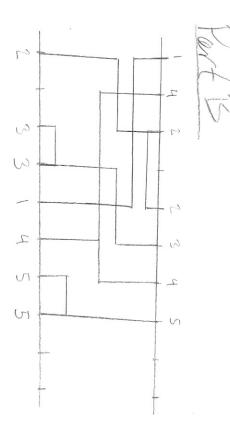
4) A make router can be used in multiple layers by either counting 3D movements as one movement or by not counting that up/dawn movements.

5) i+j+l

6) mate running:
merit: simpler
drawback: takes a let of memory

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





## **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.

