

Harjot Grewal

CSE 100 Midterm 3, Spring 2021

By completing this exam, I acknowledge and confirm that I will not give or receive any unauthorized assistance on this examination. I will conduct myself within the guidelines of the university academic integrity guidelines.

1) a) True

b) True

c) True

d) True

e) False

f) False

g) True

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2) a)  $c[i, j] = \begin{cases} 0 & \text{if } i=0 \text{ or } j=0 \\ c[i-1, j-1] + 1 & \text{if } i, j > 0 \text{ and } x_i = y_j \\ \max(c[i, j-1], c[i-1, j]) & \text{if } i, j > 0 \text{ and } x_i \neq y_j \end{cases}$

b)

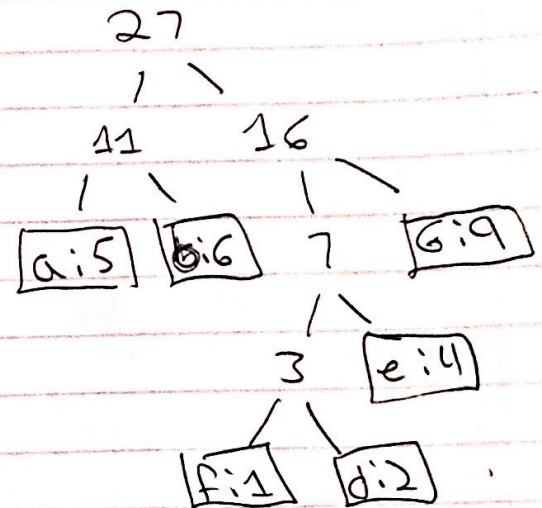
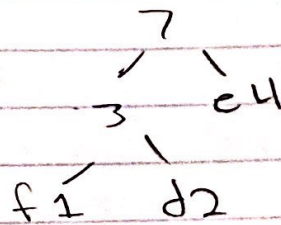
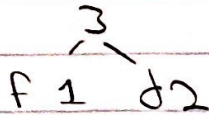
		j				
		$y_j$	A	B	B	A
i		0	1	2	3	4
$x_i$	0	0	0	0	0	0
A	1	0	1	1	1	1
C	2	0	1	1	1	1
B	3	0	1	2	2	2
A	4	0	1	2	2	3
B	5	0	1	2	3	3



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3) a)  $\begin{array}{c|c|c|c|c|c} a & b & c & d & e & f \\ \hline 5 & 6 & 9 & 2 & 4 & 1 \end{array}$



b)  $\begin{array}{c} 22 \\ \wedge \\ 5(2)+6(2)+9(2)+2(4)+4(3)+1(1) \end{array} \begin{array}{c} 26 \\ \wedge \\ 5(3)+6(3)+9(3)+2(3)+4(3)+1(3) \end{array} \begin{array}{c} 16 \\ \wedge \\ 5(3)+6(3)+9(3)+2(3)+4(3)+1(3) \end{array}$

c)  $\begin{array}{c} 33 \\ \wedge \\ 5(3)+6(3)+9(3)+2(3)+4(3)+1(3) \end{array} \begin{array}{c} 33 \\ \wedge \\ 5(3)+6(3)+9(3)+2(3)+4(3)+1(3) \end{array} \begin{array}{c} 15 \\ \wedge \\ 5(3)+6(3)+9(3)+2(3)+4(3)+1(3) \end{array}$

a	00
b	01
c	11
d	1001
e	101
f	1000

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4) a) Dijkstra ( $G, w, s$ )

- 1 Initialize-Single-Source ( $G, s$ )
- 2  $S = \emptyset$
- 3  $Q = G.V$
- 4 while  $Q \neq \emptyset$
- 5      $u = \text{Extract-Min}(Q)$
- 6      $S = S \cup \{u\}$
- 7     for each vertex  $v \in G.\text{Adj}[u]$
- 8         Relax( $u, v, w$ )

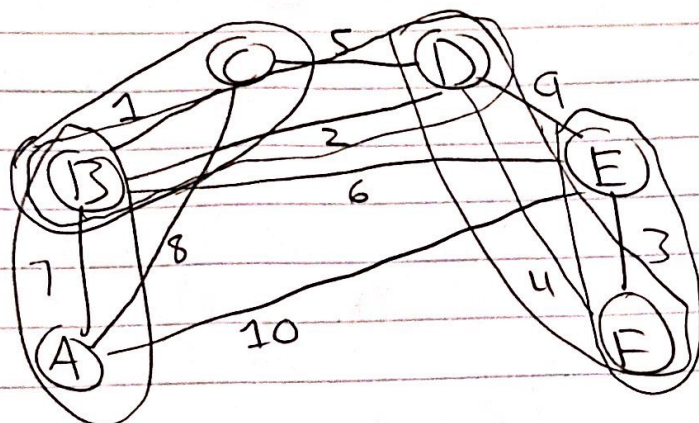
b)

	S	+	x	y	<u>z</u>
1	0	$\infty$	$\infty$	$\infty$	$\infty$
2	0	10	$\infty$	5	$\infty$
3	0	8	14	5	7
4	0	8	13	5	7
5	0	8	9	5	7
6	0	8	9	5	7



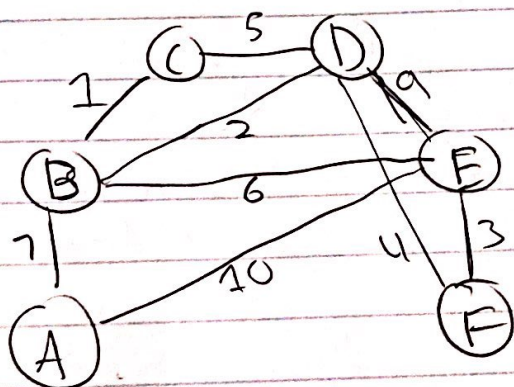
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5) a)



(B, C)  
(B, D)  
(E, F)  
(D, F)  
(B, A)

b)



A as initial  
vertex

(A, B)  
(A, C)  
(B, D)  
(D, F)  
(E, F)

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6) top down:

1. for  $i = 0$  to  $n-1$  do

2. int  $F(n)$

Array  $A[0 \dots n]$

$A[0] = 0, A[1] = 1$

$A[2] = A[3] = \dots A[n] = -\text{infinity}$

return  $\text{Aux-F}(A, n)$

int  $\text{Aux-F}(n)$

if  $A[n] \geq 0$  return  $A[n]$

$A[n] = \text{Aux-F}(A, n-1) + \text{Aux-F}(A, n-2)$

return  $A[n]$



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7)

$$D(0) =$$

	1	2	3	4	5
1	0	3	8	$\infty$	-4
2	$\infty$	0	$\infty$	1	7
3	$\infty$	4	0	$\infty$	$\infty$
4	2	8	-5	0	$\infty$
5	$\infty$	$\infty$	$\infty$	6	0

$$D(1) =$$

	1	2	3	4	5
1	0	3	8	$\infty$	-4
2	$\infty$	0	$\infty$	1	7
3	$\infty$	4	0	$\infty$	$\infty$
4	2	5	-5	0	-2
5	$\infty$	$\infty$	$\infty$	6	0

$$D(2) =$$

	1	2	3	4	5
1	0	3	8	4	-4
2	$\infty$	0	$\infty$	1	7
3	$\infty$	4	0	5	11
4	2	5	-5	0	-2
5	$\infty$	$\infty$	$\infty$	6	0

$$D(3) =$$

	1	2	3	4	5
1	0	1	-3	2	-4
2	3	0	-4	1	-1
3	7	4	0	5	3
4	2	-1	-5	0	-2
5	8	5	1	6	0

$$D(4) =$$

	1	2	3	4	5
1	0	3	-1	4	-4
2	3	0	-4	1	-1
3	7	4	0	5	3
4	2	-1	-5	0	-2
5	8	5	1	6	0

$$D(5) =$$

	1	2	3	4	5
1	0	1	-3	2	-4
2	3	0	-4	1	-1
3	7	4	0	5	3
4	2	-1	-5	0	-2
5	8	5	1	6	0

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8) a)