CTIS264 Quiz 2 10/10/13

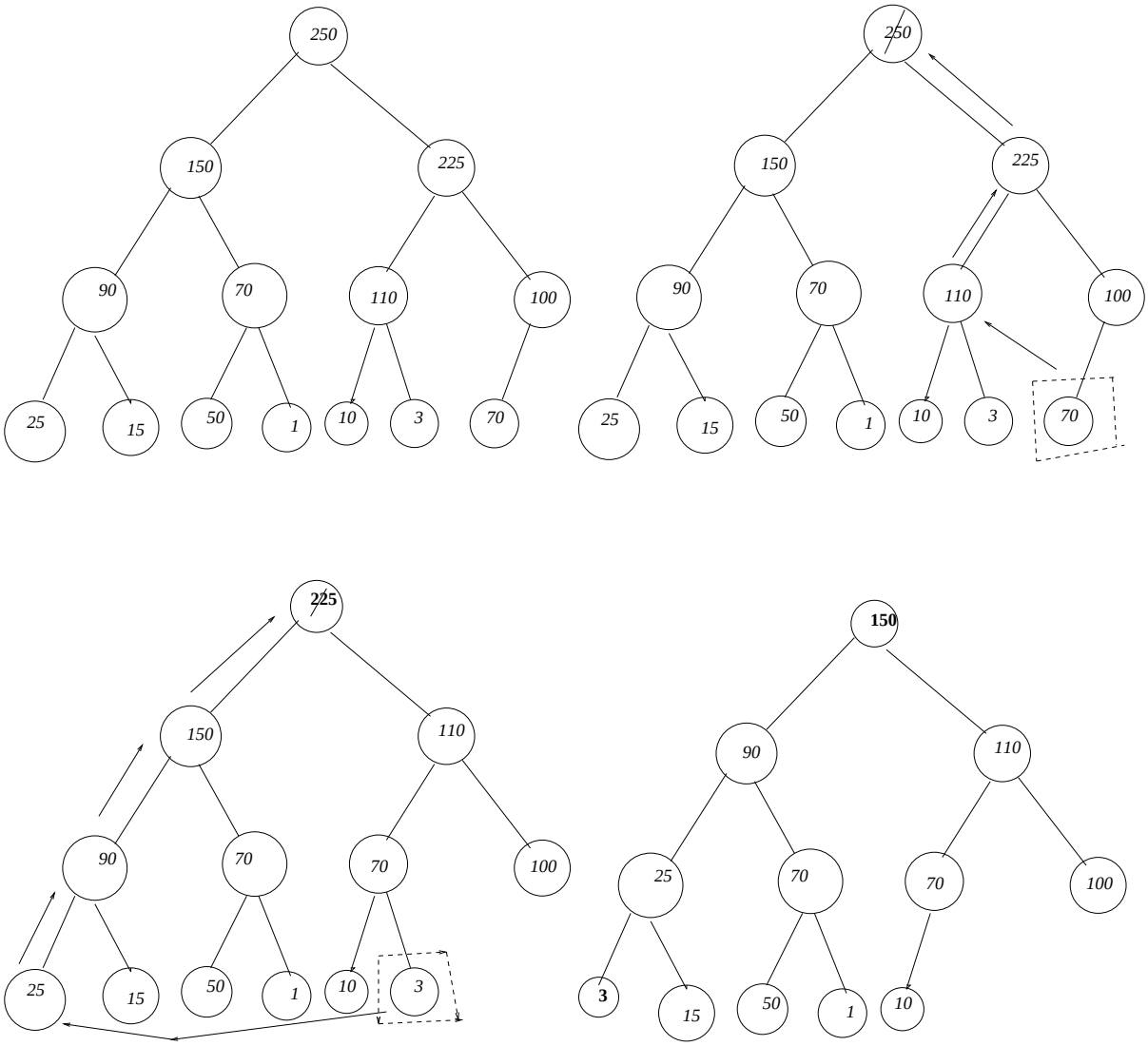
Name: Section: Student No:

Closed Book, closed note exam. Show your work! we must follow your reasoning. Give the best result that you can give! Over 100 points is bonus.

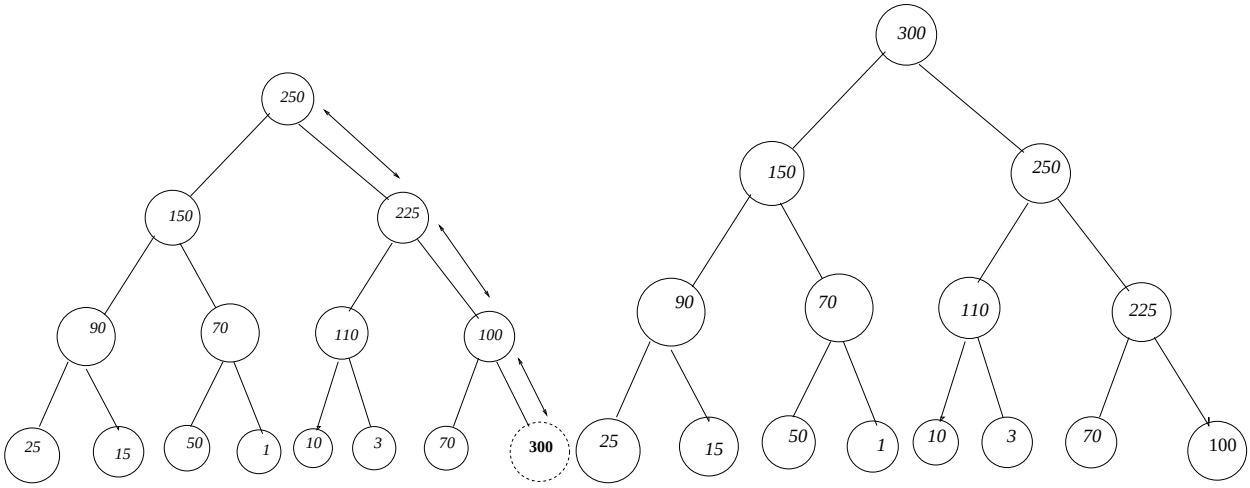
SIGNATURE	Time of Submission:

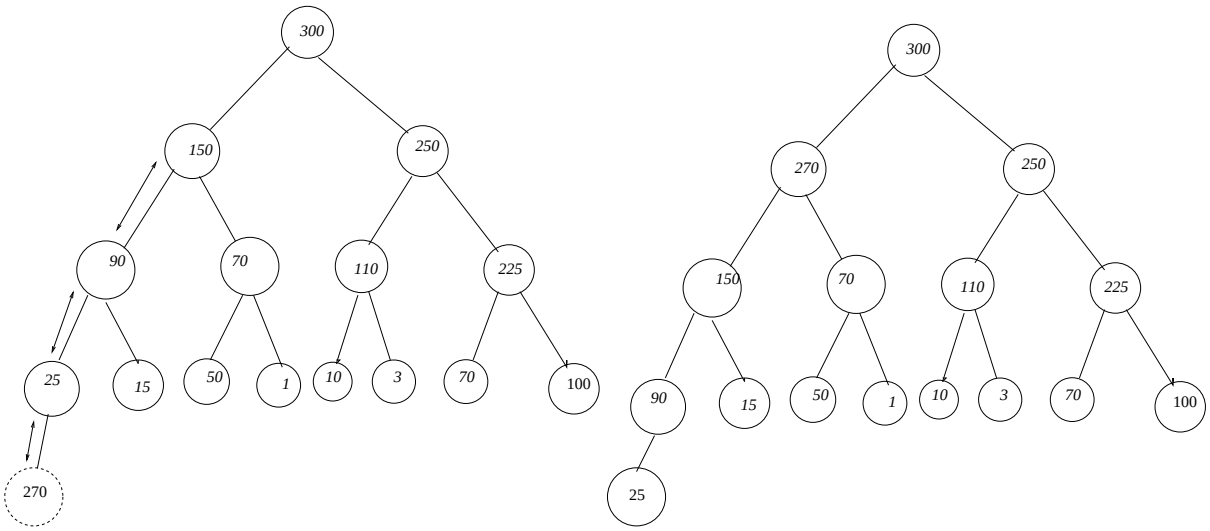
1. Given Heap H_o, apply succesively:

apply twice deletemax operation to H_o (**5 pts** each)



i) insert 300, insert 270 successively (**2 pts**)





2. **Hashing**. Let $h(k) = k \bmod 17$ and $h_2'(k) = k$ **mod** 11 and $h_2(k) = h_2'(k)$ if $h_2'(k) > 0$, and $h_2(k) = 1$ otherwise. Let $h(k,i) = (h_1(k) + ih_2(k)) \mathbf{mod} 17$. Using the sequence h(k,i) i=0, 1, 2, ... We want to place following in a Hash table: 40, 21,4, 67, 31, 38, 37, 54, 6, 23, 7, 33, 50

4 pts

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Notation: h(k,i)=$h_1(k) + ih_2(k)$=t $\mapsto$ A(t)=k

First, let us compute h(k) for each k:

k	40	21	4	67	31	38	37	54	6	23	7	33	50
h_1(k)	6	4	4	16	14	4	3	3	6	6	7	16	16
h_2(k)	7	10	4	1	9	5	4	10	6	1	7	1	6
t	6	4	8	16	14	9	3	13	12	7	11	0	5

k=40 $h_1(k) = 6$, $\mapsto$ A(6)=40
k=21 $h_1(k) = 4$, $\mapsto$ A(4)=21
k=4 $h_1(k) = 4 = h_2(k)$, 4 + 4 = t , i=1, $\mapsto$ A(8)=4
k=67 $h_1(k) = 16$, $\mapsto$ A(16)=67
k=31 $h_1(k) = 14$, $\mapsto$ A(14)=31
k=38 $h_1(k) = 4$, $h_2(k) = 5$, 4+5=t, i=1, $\mapsto$ A(9)=38
k=37 $h_1(k) = 3$, $\mapsto$ A(3)=37
k=54 $h_1(k) = 3$, $h_2(k) = 10$, 3+10=t, i=1, $\mapsto$ A(13)=54
k=6 $h_1(k) = 6$, $h_2(k) = 6$, 6+6=t, i=1, $\mapsto$ A(12)=6
k=23 $h_1(k) = 6$, $h_2(k) = 1$, 6+1=t, i=1, $\mapsto$ A(7)=23
k=7 $h_1(k) = 7$, $h_2(k) = 7$, 7, 14, 21=4, 11=t, i=3, $\mapsto$ A(11)=7
k=33 $h_1(k) = 16$, $h_2(k) = 1$, 16+1=0=t, i=1, $\mapsto$ A(0)=33
k=50 $h_1(k) = 16$, $h_2(k) = 6$, 16+6=5=t, i=1, $\mapsto$ A(5)=50

Thus we obtain the table:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
33			37	21	50	40	23	4	38		7	6	54	31		67

– Solve the same input with h_1 and linear probing

2 pts

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

First, let us compute h(k) for each k:

k	40	21	4	67	31	38	37	54	6	23	7	33	50
h(k)	6	4	4	16	14	4	3	3	6	6	7	16	16

For each k if h(k) is empty, you place k at postion h(k), otherwise you increase h(k) by 1 in a circular fashion, until you find an empty spot.

In terms of double hashing $h_2(k) = 1$ for each k.

Thus we obtain the table:

k=40, h(k)=6, A(6)=40
k=21, h(k)=4, A(4)=21
k=4, h(k)=4, 4 is full A(5)=4
k=67, h(k)=16, A(16)=67
k=31, h(k)=14, A(14)=31
k=38, h(k)=4, 4,5,6 is full, A(7)=38
k=37, h(k)=3, A(3)=37
k=54, h(k)=3, 3,4,5,6,7 is full, A(8)=54
k=6, h(k)=6, 6,7,8 is full A(9)=6
k=23, h(k)=6, 6,7,8,9 is full, A(10)=23
k=7, h(k)=7, 7,8,9,10 is full, A(11)=7
k=33, h(k)=16, 16 is full, A(0)=33
k=50, h(k)=16, 16, 0 is full A(1)=50

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
33	50		37	21	4	40	38	54	6	23	7			31		67