University of Nevada, Las Vegas Computer Science 477/677 Spring 2022

Answers to Assignment 3: Due Monday February 28, 2022, Midnight

Read the handouts sorting.pdf,

1. Fill in the blanks. One word per blank.

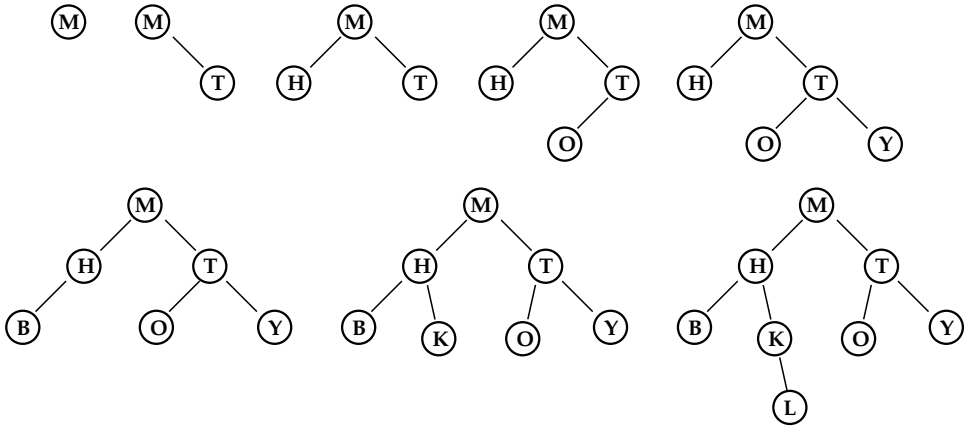
   (a) The worst case number of comparisons during an execution of a comparison based sorting algorithm with an input of size n is $\Omega(\log n!) = \Omega(n \log n)$.

   (b) The items stored in a priority queue represent **unfulfilled obligations**.

   A linked list has a *head* and a *rear*. Which of those will be the top, if linked list implements a stack? **head.**

2. Execute treesort by hand to sort the file MTHOYBKL.

   (a) Create a binary search tree, inserting each item in the order given.



   (b) Write the items in inorder. **BHKLMOTY**

3. Execute mergesort by hand with input file MTHOYBKL.

   MTHOYBKL
   MTHO YBKL
   MT HO YB KL
   MT HO BY KL
   HMOT BKLY
   BHKLMOTY

4. Execute heapsort with input file MTHOYBKL. Use array below. Add additional rows if needed.

   Items in the sorted part are in boldface.

M	T	H	O	Y	B	K	L
M	T	K	O	Y	B	H	L
M	Y	K	O	T	B	H	L
Y	M	K	O	T	B	H	L
Y	T	K	O	M	B	H	L
L	T	K	O	M	B	H	**Y**
T	L	K	O	M	B	H	**Y**
T	O	K	L	M	B	H	**Y**
H	O	K	L	M	B	**T**	**Y**
O	H	K	L	M	B	**T**	**Y**
O	M	K	L	H	B	**T**	**Y**
B	M	K	L	H	**O**	**T**	**Y**
M	B	K	L	H	**O**	**T**	**Y**
M	L	K	B	H	**O**	**T**	**Y**
H	L	K	B	**M**	**O**	**T**	**Y**
L	H	K	B	**M**	**O**	**T**	**Y**
L	H	K	B	**M**	**O**	**T**	**Y**
B	H	K	**L**	**M**	**O**	**T**	**Y**
K	H	B	**L**	**M**	**O**	**T**	**Y**
B	H	**K**	**L**	**M**	**O**	**T**	**Y**
H	B	**K**	**L**	**M**	**O**	**T**	**Y**
B	**H**	**K**	**L**	**M**	**O**	**T**	**Y**
B	**H**	**K**	**L**	**M**	**O**	**T**	**Y**

5. Consider the array implementation of a stack of letters.

   The bottom of the stack is in position 1.

   (a) Show the structure after the following items have been pushed in this order: B, R, Y, E, M.

1	2	3	4	5
B	R	Y	E	M

   5

   5 is the location of the top of the stack.

   (b) Show the structure after **pop** has been executed twice.

1	2	3	4	5
B	R	Y	E	M

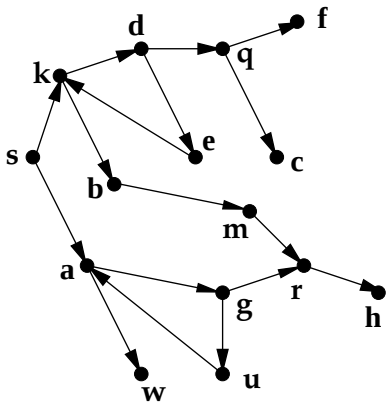
   3

   Popped items are not erased, since we are using "lazy delete." But the indicates that the top is in position 3. the stack now contains only 3 items, namely B, R, and Y, where Y is the top item.

6. In class we discussed three strategies for handling the false overflow problem for a queue implemented as an array. What were these strategies? (No more than three words to name each strategy. No need to give full explanations.)

slide
wrap
make array larger

7.



Write the depth first search traversal of the vertices of the directed graph G shown here, then write the breadth first search traversal. In both cases use the alphabetic rule to break ties, so that everyone who works the problem correctly will have the same answer.

DF: sagurhkbmdeqcf
BF: sakgwbdrueqhcf

8. In the tiny Republic of Triland (pop 257) each citizen has a unique postal code consisting of three digits. Sort the following list of Trilandian postal codes using radix sort. Show the buckets at each phase.

Unsorted: 569 045 337 192 893 450 677 190 320 537 232 554 256 512 189 121 961 300

0	1	2	3	4	5	6	7	8	9
450	121	192	893	554	045	256	337		569
190	961	232					677		189
320		512					537		
300									

Concatenation: 450 190 320 300 121 961 192 232 512 893 554 045 256 337 677 537 569 189

0	1	2	3	4	5	6	7	8	9
300	512	320	232	845	450	961	677	189	190
		121	337		554	569			192
			537		256				893

Concatenation: 300 512 320 121 232 337 537 845 450 554 256 961 569 677 189 190 192 893

0	1	2	3	4	5	6	7	8	9
	121	232	300	450	512	677		845	961
	189	256	320		537			893	
	190		337		554				
	192				569				

Concatenation: 121 189 190 192 232 256 300 320 337 450 512 537 554 569 677 845 893 961

Sorted.