

13 Points

Q1.1

1 Point

For which of the following functions is the Big-O approximation the same as the Tilda approximation?

$$f(n) = n^2 + n$$

$$\Box \ f(n) = 5n^2 + 7n$$

$$f(n) = n^2 + 7n$$

Q1.2

1 Point

Assuming all keys are b-bits wide, the worst-case number of \mathbf{key} comparisons to insert into a Digital Search Tree is:

	11
	U

$$led \Theta(b)$$

$$ightharpoonup \Omega(b)$$

$$ightharpoonup O(b^2)$$

$$\square \Omega(b^2)$$

Q1.3

1 Point

Assuming all keys are b-bits wide, the worst-case number of **key comparisons** to insert a into a 2-way Radix Search Trie is:

✓ O(1)
\square $O(b)$
\square $\Theta(b)$
\square $\Omega(b)$
$\square \ O(b^2)$
$\square \; \Theta(b^2)$
$\ \ \ \Omega(b^2)$

Q1.4

1 Point

Assuming all keys are b-bits wide, the worst-case number of ${\bf bit}$ comparisons to insert into a Digital Search Tree is:



Q1.5

1 Point

Assuming all keys are b-bits wide, the worst-case number of ${\it bit\ comparisons}$ to insert into a 2-way Radix Search Trie is:

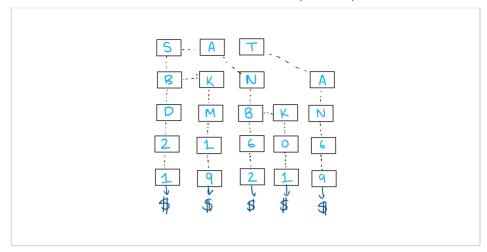
Vie	w Submission Gradescope
O(1)	
$\bigcirc O(b)$	
$left \Theta(b)$	
$left{f Q}(b)$	
$\bigcirc O(b^2)$	
$\square \; \Theta(b^2)$	
$\ \ \ \Omega(b^2)$	
Q1.6 1 Point	
consider a 2-way Radix Search Trie with the f	ollowing keys (as 4-bit integers): 5 (0101), 10 (1010),
11 (1011), 3 (0011), 15 (1111). What is the height o	f the trie? (Only an empty trie has a height of zero)
4	
Q1.7 1 Point	
	ring keys (as 4-bit integers): 5 (0101), 10 (1010), 11 ne tree? (Only an empty tree has a height of zero)
3	The tree. (Only are empty tree has a neight of zero)
3	
Q1.8 1 Point	
Which of the following key sequences (as 4-b	oit integers) gives a DST with the largest height?
o 5 (0101), 10 (1010), 12 (1100), 15 (1111)	
O 5 (0101), 10 (1010), 11 (1011), 3 (0011), 15 (1111)	
O 5 (0101), 10 (1010), 11 (1011), 3 (0011), 15 (1111), 2 (0010)	
O 5 (0101), 10 (1010), 11 (1011), 3 (0011), 15 (1111)	, 2 (0010), 4 (0100)
Q1.9 1 Point	
The runtime of Horner's hashing method is co	onstant regardless of the key length.
O True	
• False	

Q1.10 1 Point	
All brute-force algorithms	have exponential worst-case runtime.
True	
O False	
Q1.11 I Point	
	runtime of an algorithm is $nlogn$ and the asymptotic worst-case runn is $n^2.$ The runtime of the algorithm is then:
$\square \ O(2^n)$	
\bigcirc $O(n^2)$	
\square $O(nlogn)$	
\bigcirc $O(logn)$	
\square $\Omega(1)$	
$\square \; \Theta(n^2)$	
$\square \ \Theta(nlogn)$	
$\ \ \ \Omega(n^2)$	
$leftrightarrow \Omega(nlogn)$	
Q1.12 1 Point	
	a 4x4 grid, the backtracking algorithm that searches for all possible ticular tile has to make at most decisions, with at most on.
$0.15^2, 7$	
) 15, 7	
O 4, 4	
Q1.13 I Point	

Which of the following Symbol Table implementations require(s) the key type to implement the

Java Comparable interface?

Unsorted Linked list with Linear Search Sorted Linked list with Linear Search Unsorted Array with Binary Search ✓ Sorted Array with Binary Search ✓ Binary Search Tree Digital Search Tree Digital Search Trie R-way Radix Search Trie DLB Trie Hash table G2 4 Points Assume that you have been tasked with building a symbol table that will map Pitt usern full names (e.g., the key abc123 would map to the value "Bot Anonymous"). Further, ass you will be using this symbol table to perform the following operations: Operation 1: Given a username, return the associated full name. Operation 2: Given a sequence of 3 characters (e.g., abc), determine the next available (e.g., if abc1 to abc123 exist, then 124 is the next available number. G2.1 1 Point Assuming that you select to use a DLB Trie to implement the symbol table. Draw the DL inserting five Pitt usernames of your choice. List the usernames that you selected. SBD22, SKM19, ANB62, ANK01, TAN71	ed Linked list with Linear Search onted Array with Binary Search ed Array with Binary	Sorted Linked list with Linear Search	
Unsorted Array with Linear Search Sorted Array with Binary Search Binary Search Tree Digital Search Tree 2-way Radix Search Trie R-way Radix Search Trie DLB Trie Hash table G2 4 Points Assume that you have been tasked with building a symbol table that will map Pitt usern full names (e.g., the key abc123 would map to the value "Bot Anonymous"). Further, ass you will be using this symbol table to perform the following operations: Operation 1: Given a username, return the associated full name. Operation 2: Given a sequence of 3 characters (e.g., abc), determine the next available (e.g., if abc1 to abc123 exist, then 124 is the next available number. G2.1 1 Point Assuming that you select to use a DLB Trie to implement the symbol table. Draw the DL inserting five Pitt usernames of your choice. List the usernames that you selected.	orted Array with Linear Search ed Array with Binary Search rry Search Tree tal Search Tree ay Radix Search Trie Trie Trie th table that you have been tasked with building a symbol table that will map Pitt usernames to so (e.g., the key abc123 would map to the value "Bot Anonymous"). Further, assume that e using this symbol table to perform the following operations: 1: Given a username, return the associated full name. 1: Given a sequence of 3 characters (e.g., abc), determine the next available number and to abc123 exist, then 124 is the next available number. If that you select to use a DLB Trie to implement the symbol table. Draw the DLB after five Pitt usernames of your choice. List the usernames that you selected.		
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SBD22, SKM19, ANB62, ANK01, TAN71	SKM19, ANB62, ANK01, TAN71		
		• •	
		sserting five Pitt usernames of your choice. Li	
Q2.2		sserting five Pitt usernames of your choice. Li	
		sserting five Pitt usernames of your choice. Li SBD22, SKM19, ANB62, ANK01, TAN71	
Point	our drawing:	sserting five Pitt usernames of your choice. Li SBD22, SKM19, ANB62, ANK01, TAN71	



Q2.3

1 Point

What is the asymptotic worst-case runtime of **Operation 1** using your data structure?

O(wR)

Q2.4

1 Point

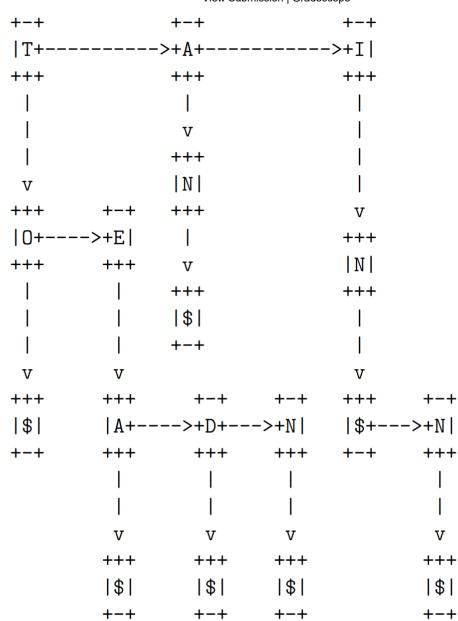
What is the asymptotic worst-case runtime of **Operation 2** using your data structure?

O(wR)

Q3

7 Points

Consider the following De La Briandais (DLB) Trie. \$ is the string termination character. Answer the following questions with respect to the given trie.



Q3.1

1 Point

The root node of the given trie is the node that contains the letter

Т

Q3.2

1 Point

The number of keys in the trie is

7

Q3.3

1 Point

The string IN is:
O neither a prefix nor a word#
O a prefix but not a word
O a word but not a prefixx
o both a word and a prefixx

Q3.4

1 Point

The number of letter comparisons for the target string TEAR is

5

Q3.5

1 Point

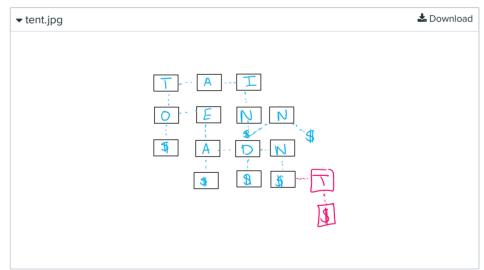
The number of letter comparisons for the target string INK is

6

Q3.6

1 Point

Draw the trie after inserting the string TENT.



Q3.7

1 Point

The number of nodes that you had to add to the trie in the previous question is

2

Но	mework 1	• GRADED
STUD Sush	DENT Iruti Bansod	
	L POINTS 6 / 24 pts	
	STION 1	
(no t		8 / 13 pts
1.1	(no title)	1 /1 pt
1.2	(no title)	1 /1 pt
1.3	(no title)	0 /1 pt
1.4	(no title)	1 /1 pt
1.5	(no title)	1 /1 pt
1.6	(no title)	0 /1 pt
1.7	(no title)	1 /1 pt
1.8	(no title)	1/1 pt
1.9	(no title)	1/1 pt
1.10	(no title)	0 / 1 pt
1.11	(no title)	0 / 1 pt
1.12	(no title)	0 / 1 pt
1.13	(no title)	1 /1 pt
QUES	STION 2	
(no t	title)	4 / 4 pts
2.1	(no title)	1 /1 pt
2.2	(no title)	1 /1 pt
2.3	(no title)	1 /1 pt
2.4	(no title)	1/1 pt
	STION 3	
(no t		6.5 / 7 pts 1 /1 pt
3.1	(no title)	
3.2	(no title)	1 /1 pt
3.3	(no title)	1/1 pt
3.4	(no title)	1/1 pt
3.5	(no title)	1/1 pt
3.6	(no title)	0.5 /1 pt
3.7	(no title)	1 /1 pt