CSCE 146 Practice Midterm 2 No Answers

04 Recursion

1. Based on the following code snippet, clearly fill in ALL true statements.

`public static void q01Method01(int[] a)`
`{`
`  if(a == null || a.length < 1)`
`  return;`
`  System.out.print(a[a.length-1]+" ");`
`  int halfSize = a.length/2;`
`  if(halfSize > 0)`
`  {`
`  int[] newArr = new int[a.length/2];`
`  for(int i=0;i<newArr.length;i++)`
`  {`
`  newArr[i] = a[i];`
`  }`
`  q01Method01(newArr);`
`  }`
`}`
	Code Snippet

`int[] a = {1,2,3,4,5,6,7,8};`
`q01Method01(a);`
`int[] b = {16,12,8,4,0,-4,-8,-12};`
`q01Method01(b);`
`int[] c = {10,11,12,13,14};`
`q01Method01(c);`
`int[] d = {1};`
`q01Method01(d);`
	Code Snippet in Main Method

- Provided array "a" the method will print "8 4 2"
- Provided with array "b" the method will print 4 values.
- Provided with array "c" the method will print "14, 11, 10"
- Provided with array "d" the method will crash with an "IndexOutOfBoundsException"
- All the above statements are false.

2. Based on the following recursive function definition and code snippets, clearly fill in ALL true statements.

$F(1) = 1$ $F(2) = 2$ $F(3) = 3$ $F(n) = n \times F(n-1) \times F(n-2),$ $for\ n \geq 1\ and\ n \in \mathbb{Z}$	Recursive Function

`public static int q02Recursive01(int n)`
`{`
`  if(n == 1)`
`  return 1;`
`  else if(n == 2)`
`  return 2;`
`  else if(n == 3)`
`  return 3;`
`  else`
`  return n+q02Recursive01(n-1)+q02Recursive01(n-2);`
`}`
	Code Snippet 1

`public static int q02Recursive02(int n)`
`{`
`  if(n == 1)`
`  return 1;`
`  else if(n == 2)`
`  return 2;`
`  else if(n == 3)`
`  return 3;`
`  else`
`  return n*q02Recursive02(n-1)*q02Recursive02(n-2);`
`}`
	Code Snippet 2

`public static int q02Recursive03(int n)`
`{`
`  if(n == 1)`
`  return 1;`
`  else if(n == 2)`
`  return 2;`
`  else if(n == 3)`
`  return 3;`
`  else`
`  return n*q02Recursive03(n--)*q02Recursive03(n--);`
`}`
	Code Snippet 3

- ○ If "n" is the value 5, then Code Snippet 1 will return 360
- ○ If "n" is the value 5, then Code Snippet 2 will return 360
- ○ If "n" is the value 5, then Code Snippet 3 will return 360
- ○ Code Snippet 1 most accurately represents the Recursive Function in Java Code.
- ○ All the above statements are false.

05 Big O, Complexity, and Asmyptotics

3. Based on the following algorithms, and their associated Big O time complexities, clearly fill ALL true statement.

Binary search Merge Sort Quick Sort BST Add Method for an Unbalanced Tree Tower of Hanoi – (2^n) Travelling Sales Person Assigning a Variable	Algorithms

   - If we ordered each of these from fastest to slowest based on the Big O time complexity, then Towers of Hanoi would be last in the list.
   - If we ordered each of these from fastest to slowest based on the Big O time complexity, then Binary Search would be second in the list.
   - If we ordered each of these from fastest to slowest based on the Big O time complexity, then Merge Sort would occur before Quick Sort.
   - The Add Method for an Unbalanced Tree will be O(lg(n))
   - All the above statements are false.

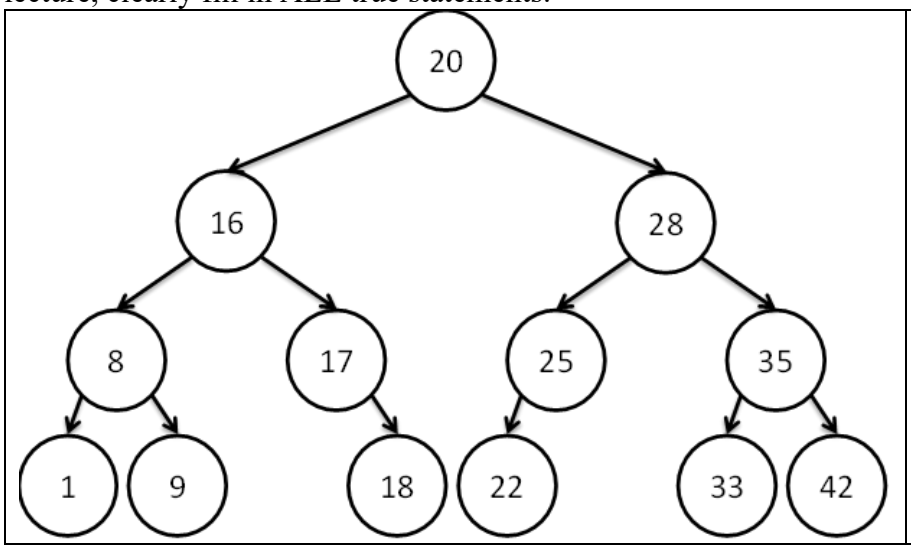
4. Based on the following math functions, clearly fill in ALL true statements.

$F(n) = n^2 + \text{n} \times \sin(n) + 5{,}280$ $G(n) = n^5 + 2n^4 + 10n^3 + 3n^4$ $H(n) = 2^n + 1$	Math Functions

   - We may say that F(n) is $O(n^3)$
   - We may say that F(n) is $O(n^2)$
   - We may say that G(n) is $O(n^5)$
   - We may say that H(n) is O(n!)
   - All the above statements are false.

06 Binary Search Trees

5. Based on the following Binary Search Tree, and assuming it does not self-balance and remove privileges the minimum out of the maximum set as demonstrated in lecture, clearly fill in ALL true statements.



Binary Search Tree

- If the value 10 is added, then it will become the left child of node 9.
- If the value 28 is removed, then value 33 will take its place.
- The tree is currently balanced.
- If the value 20 is removed, then 28 takes its place.
- All the above statements are false.

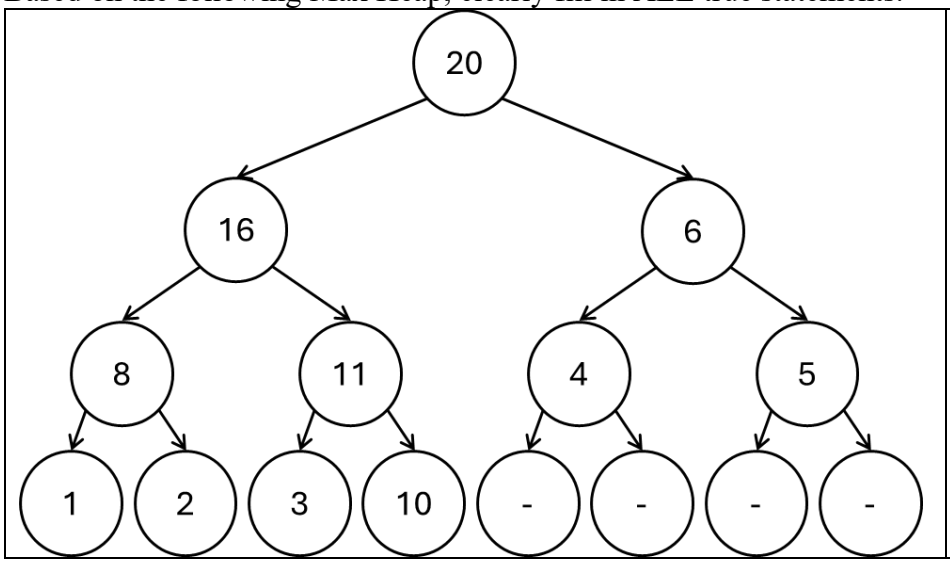
6. Based on the following operations for a Binary Search Tree, and assuming it does not self-balance and remove privileges the minimum out of the maximum set as demonstrated in lecture, clearly fill in ALL true statements.

1. Add the values in order <8,4,2,1,16,12,20,11> 2. Remove 4 3. Add the value in order <3,5,10> 4. Remove 16 5. Add the values in order <24,7>	Binary Search Tree Operations

- ○ The pre-order traversal for the resulting tree will be 1, 2, 3, 5, 7, 8, 10, 11, 12, 20, 24.
- ○ The in-order traversal for the resulting tree will be 8, 2, 1, 3, 5, 7, 20, 12, 11, 10, 24
- ○ The post-order traversal for the resulting tree will be 1, 7, 5, 3, 2, 10, 11, 12, 24, 20, 8
- ○ The resulting tree is unbalanced.
- ○ All the above statements are false.

07 Heaps

7. Based on the following Max Heap, clearly fill in ALL true statements.



Max Heap

- If the value 5 is added, then it will become the right child of 4.
- If the value 22 is added, then its right child will be 20.
- If we remove twice, then the root value will be 11.
- If we add the value 0, then it will be the left child of 1.
- All the above statements are false.

8. Based on the following provided Min Heap an array and the following Heap operations, clearly fill in ALL true statements.

Index	0	1	2	3	4	5	6	7
Value	7	14	8	16	15	10	9	-

The root value is located at index 0.

Initial Min Heap

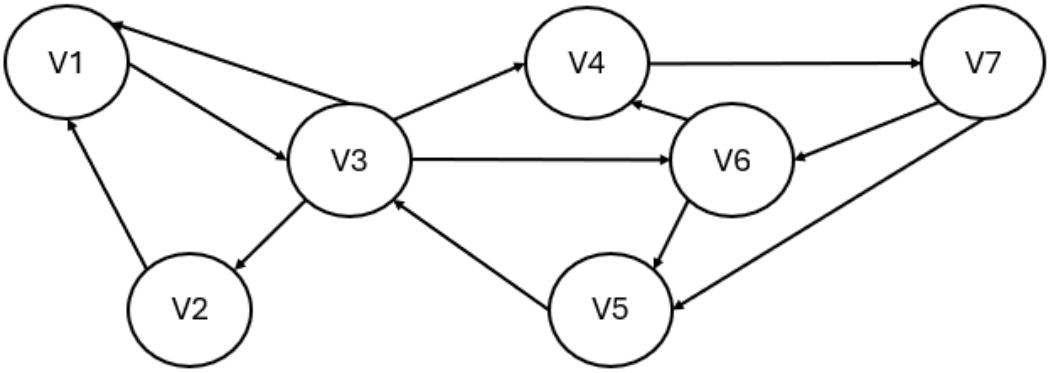
1. Remove 3 times
2. Add the value 7
3. Add the value 12
4. Add the value 23
5. Remove 2 times

Heap Operations

- The root value after all operations will be 12.
- The last value after all operations will be 23.
- The left most child will be 23.
- The tree is balanced.
- All the above statements are false.

08 Graphs (FINAL EXAM ONLY)

9. Based on the following graph and assuming that in the event of ties the smaller numeric values are selected, clearly fill in ALL true statements.



- ○ The DFS starting from vertex V1 will be V1, V3, V2, V4, V7, V5, V6
- ○ The BFS starting from vertex V1 will be V1, V3, V2, V4, V6, V7, V5
- ○ The DFS starting from vertex V5 will be V5, V3, V1, V2, V4, V7, V6
- ○ Starting from vertex V5, all other vertices are reachable.
- ○ All the above statements are false.

10. Based on the following adjacency matrix graph and assuming that in the event of ties the smaller numeric values are selected, clearly fill in ALL true statements.

	V1	V2	V3	V4	v5
V1	1	1	1	0	0
V2	0	0	0	0	1
V3	1	0	1	0	0
V4	1	0	1	0	0
V5	0	1	0	0	0

- ○ The DFS from V1 will be V1, V2, V5, V3, V4
- ○ The BFS from V1 will be V1, V2, V3, V5, V4
- ○ The DFS from V4 will be V4, V1, V2, V5, V3
- ○ The graph described can be considered a tree with its root at V1.
- ○ All the above statements are false.