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## CS301- Data Structures

**JAN 30,2011**

**LATEST SOLVED MCQS FROM FINALTERM PAPERS**

**MC100401285**

**Moaz.pk@gmail.com**

**MC100401285@gmail.com**

**PSMD01**

### FINALTERM EXAMINATION Spring 2010

**Question No: 1 ( Marks: 1 ) - Please choose one**

A solution is said to be efficient if it solves the problem within its resource constraints i.e. hardware and time.

- ▶ **True (Page 4)**
- ▶ False

**Question No: 2 ( Marks: 1 ) - Please choose one**

Which one of the following is known as "Last-In, First-Out" or LIFO Data Structure?

- ▶ Linked List
- ▶ **Stack (Page 54)**
- ▶ Queue
- ▶ Tree

**Question No: 3 ( Marks: 1 ) - Please choose one**

What will be postfix expression of the following infix expression?

Infix Expression :  $a+b*c-d$

- ▶  $ab+c*d-$
- ▶  **$abc**d-$**
- ▶  $abc+*d-$
- ▶  $abcd+*-$

**Question No: 4 ( Marks: 1 ) - Please choose one**

For compiler a postfix expression is easier to evaluate than infix expression?

- ▶ **True [Click here for detail](#)**
- ▶ False

**Question No: 5 ( Marks: 1 ) - Please choose one**

**Consider the following pseudo code**

declare a stack of characters

while ( there are more characters in the word to read )

{

**Muhammad Moaz Siddiq – MCS (2nd)**  
**[mc100401285@gmail.com](mailto:mc100401285@gmail.com)**  
**Campus:- Institute of E-Learning & Modern**  
**Studies (IEMS) Samundari**

```
    read a character
    push the character on the stack
}
while ( the stack is not empty )
{
    pop a character off the stack
    write the character to the screen
}
```

**What is written to the screen for the input "apples"?**

- ▶ selpa
- ▶ **selppa**
- ▶ apples
- ▶ aaapppplleess

**Question No: 6 ( Marks: 1 ) - Please choose one**

Consider the following function:

```
void test_a(int n)
{
    cout << n << " ";
    if (n>0)
        test_a(n-2);
}
```

What is printed by the call test\_a(4)?

- ▶ **4 2**
- ▶ 0 2 4
- ▶ 0 2
- ▶ 2 4

**Question No: 7 ( Marks: 1 ) - Please choose one**

If there are N external nodes in a binary tree then what will be the no. of internal nodes in this binary tree?

- ▶ **N -1 (Page 304)**
- ▶ N+1
- ▶ N+2
- ▶ N

**Question No: 8 ( Marks: 1 ) - Please choose one**

If there are N internal nodes in a binary tree then what will be the no. of external nodes in this binary tree?

- ▶ N -1
- ▶ N
- ▶ **N +1 (Page 303)**
- ▶ N +2

**Question No: 9 ( Marks: 1 ) - Please choose one**

If we have 1000 sets each containing a single different person. Which of the following relation will be true on each set:

- ▶ **Reflexive (page 387)**
- ▶ Symmetric
- ▶ Transitive
- ▶ Associative

**Question No: 10 ( Marks: 1 ) - Please choose one**

Which one of the following is NOT the property of equivalence relation:

- ▶ Reflexive
- ▶ Symmetric
- ▶ Transitive
- ▶ **Associative (page 387)**

**Question No: 11 ( Marks: 1 ) - Please choose one**

A binary tree of N nodes has \_\_\_\_\_.

- ▶  $\log_{10} N$  levels
- ▶  **$\log_2 N$  levels (Page 212)**
- ▶  $N / 2$  levels
- ▶  $N \times 2$  levels

**Question No: 12 ( Marks: 1 ) - Please choose one**

The easiest case of deleting a node from BST is the case in which the node to be deleted \_\_\_\_\_.

- ▶ **Is a leaf node (Page 173)**
- ▶ Has left subtree only
- ▶ Has right subtree only
- ▶ Has both left and right subtree

**Question No: 13 ( Marks: 1 ) - Please choose one**

If there are N elements in an array then the number of maximum steps needed to find an element using Binary Search is \_\_\_\_\_.

- ▶ N
- ▶  $N^2$
- ▶  $N \log_2 N$
- ▶  **$\log_2 N$  (page 440)**

**Question No: 14 ( Marks: 1 ) - Please choose one**

Merge sort and quick sort both fall into the same category of sorting algorithms. What is this category?

- ▶  $O(n \log n)$  sorts
- ▶ Interchange sort (not sure)
- ▶ Average time is quadratic
- ▶ **None of the given options. (Page 488)**

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@gmail.com](mailto:mc100401285@gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 15 ( Marks: 1 ) - Please choose one**

If one pointer of the node in a binary tree is NULL then it will be a/an \_\_\_\_\_ .

- ▶ **External node (Page 303)**
- ▶ Root node
- ▶ Inner node
- ▶ Leaf node

**Question No: 16 ( Marks: 1 ) - Please choose one**

We convert the \_\_\_\_\_ pointers of binary to threads in threaded binary tree.

- ▶ Left
- ▶ Right
- ▶ **NULL (Page 312)**
- ▶ None of the given options

**Question No: 17 ( Marks: 1 ) - Please choose one**

If the bottom level of a binary tree is NOT completely filled, depicts that the tree is NOT a

- ▶ Expression tree
- ▶ Threaded binary tree
- ▶ **complete Binary tree (Page 323)**
- ▶ Perfectly complete Binary tree

**Question No: 18 ( Marks: 1 ) - Please choose one**

What is the best definition of a *collision* in a hash table?

- ▶ Two entries are identical except for their keys.
- ▶ Two entries with different data have the exact same key
- ▶ **Two entries with different keys have the same exact hash value. (page 464)**
- ▶ Two entries with the exact same key have different hash values.

**Question No: 19 ( Marks: 1 ) - Please choose one**

Suppose that a selection sort of 100 items has completed 42 iterations of the main loop. How many items are now guaranteed to be in their final spot (never to be moved again )

- ▶ 21
- ▶ 41
- ▶ **42 [Click here for detail](#)**
- ▶ 43

**Question No: 20 ( Marks: 1 ) - Please choose on**

Suppose you implement a Min heap (with the smallest element on top) in an array. Consider the different arrays below; determine the one that *cannot* possibly be a heap:

- ▶ 16, 18, 20, 22, 24, 28, 30
- ▶ 16, 20, 18, 24, 22, 30, 28
- ▶ 16, 24, 18, 28, 30, 20, 22
- ▶ **16, 24, 20, 30, 28, 18, 22 (page 334)**

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 21 ( Marks: 1 ) - Please choose one**

Do you see any problem in the code of nextInOrder below:

```
TreeNode * nextInorder(TreeNode * p)
```

```
{
    if(p->RTH == thread)
        return( p->R );
    else {
        p = p->R;
        while(p->LTH == child)
            p = p->R;
        return p;
    }
}
```

- ▶ The function has no problem and will fulfill the purpose successfully.
- ▶ The function cannot be compile as it has syntax error.
- ▶ The function has logical problem, therefore, it will not work properly.
- ▶ The function will be compiled but will throw runtime exception immediately after the control is transferred to this function.

**Question No: 22 ( Marks: 1 ) - Please choose one**

**Which of the following statement is correct about find(x) operation:**

- ▶ A find(x) on element x is performed by returning exactly the same node that is found.
- ▶ **A find(x) on element x is performed by returning the root of the tree containing x. [Click here for detail](#)**
- ▶ A find(x) on element x is performed by returning the whole tree itself containing x.
- ▶ A find(x) on element x is performed by returning TRUE.

**Question No: 23 ( Marks: 1 ) - Please choose on**

Which of the following statement is NOT correct about find operation:

- ▶ It is not a requirement that a find operation returns any specific name, just that finds on two elements return the same answer if and only if they are in the same set.
- ▶ **One idea might be to use a tree to represent each set, since each element in a tree has the same root, thus the root can be used to name the set.**
- ▶ Initially each set contains one element.
- ▶ Initially each set contains one element and it does not make sense to make a tree of one node only.

**Question No: 24 ( Marks: 1 ) - Please choose one**

In complete binary tree the bottom level is filled from \_\_\_\_\_

- ▶ **Left to right (Page 323)**
- ▶ Right to left
- ▶ Not filled at all
- ▶ None of the given options

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 25 ( Marks: 1 ) - Please choose one**

Here is an array of ten integers:

5 3 8 9 1 7 0 2 6 4

The array after the FIRST iteration of the large loop in a selection sort (sorting from smallest to largest).

▶ **0 3 8 9 1 7 5 2 6 4** (Page 477)

▶ 2 6 4 0 3 8 9 1 7 5

▶ 2 6 4 9 1 7 0 3 8 5

▶ 0 3 8 2 6 4 9 1 7 5

**Question No: 26 ( Marks: 1 ) - Please choose one**

What requirement is placed on an array, so that *binary search* may be used to locate an entry?

- ▶ The array elements must form a heap.
- ▶ The array must have at least 2 entries.
- ▶ **The array must be sorted.** [Click here for detail](#)
- ▶ The array's size must be a power of two

**FINALTERM EXAMINATION**

Spring 2010

**Question No: 1 ( Marks: 1 ) - Please choose one**

Which one of the following operations returns top value of the stack?

- ▶ Push
- ▶ Pop
- ▶ **Top** (page 53)
- ▶ First

**Question No: 2 ( Marks: 1 ) - Please choose one**

Compiler uses which one of the following in Function calls,

- ▶ **Stack** (page 80)
- ▶ Queue
- ▶ Binary Search Tree
- ▶ AVL Tree

**Question No: 3 ( Marks: 1 ) - Please choose one**

Every AVL is \_\_\_\_\_

- ▶ Binary Tree
- ▶ Complete Binary Tree
- ▶ None of these
- ▶ **Binary Search Tree** [Click here for detail](#)

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 4 ( Marks: 1 ) – Please choose one**

If there are 56 internal nodes in a binary tree then how many external nodes this binary tree will have?

- ▶ 54
- ▶ 55
- ▶ 56
- ▶ **57 (page 303)**

**Question No: 5 ( Marks: 1 ) - Please choose one**

If there are 23 external nodes in a binary tree then what will be the no. of internal nodes in this binary tree?

- ▶ 23
- ▶ 24
- ▶ 21
- ▶ **22 (page 303)**

**Question No: 6 ( Marks: 1 ) - Please choose one**

Which one of the following is not an example of equivalence relation?

- ▶ Electrical connectivity
- ▶ Set of people
- ▶  **$\leq$  relation (page 388)**
- ▶ Set of pixels

**Question No: 7 ( Marks: 1 ) - Please choose one**

Binary Search is an algorithm of searching, used with the \_\_\_\_\_ data.

- ▶ **Sorted (page 432)**
- ▶ Unsorted
- ▶ Heterogeneous
- ▶ Random

**Question No: 8 ( Marks: 1 ) - Please choose one**

Which one of the following is NOT true regarding the skip list?

- ▶ Each list  $S_i$  contains the special keys + infinity and - infinity.
- ▶ List  $S_0$  contains the keys of  $S$  in non-decreasing order.
- ▶ Each list is a subsequence of the previous one.
- ▶ **List  $S_h$  contains only the  $n$  special keys. (page 446)**

**Question No: 9 ( Marks: 1 ) - Please choose one**

A simple sorting algorithm like selection sort or bubble sort has a worst-case of

- ▶  $O(1)$  time because all lists take the same amount of time to sort
- ▶  $O(n)$  time because it has to perform  $n$  swaps to order the list.
- ▶  **$O(n^2)$  time because sorting 1 element takes  $O(n)$  time - After 1 pass through the list, either of these algorithms can guarantee that 1 element is sorted. (page 487)**
- ▶  $O(n^3)$  time, because the worst case has really random input which takes longer to sort.

**Muhammad Moaaz Siddiq – MCS (2nd)**

**mc100401285@Gmail.com**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 10 ( Marks: 1 ) - Please choose one**

Which of the following is a property of binary tree?

- ▶ A binary tree of N external nodes has N internal node.
- ▶ **A binary tree of N internal nodes has N+ 1 external node. (page 303)**
- ▶ A binary tree of N external nodes has N+ 1 internal node.
- ▶ A binary tree of N internal nodes has N- 1 external node.

**Question No: 11 ( Marks: 1 ) - Please choose one**

By using \_\_\_\_\_ we avoid the recursive method of traversing a Tree, which makes use of stacks and consumes a lot of memory and time.

- ▶ Binary tree only
- ▶ **Threaded binary tree (page 306)**
- ▶ Heap data structure
- ▶ Huffman encoding

**Question No: 12 ( Marks: 1 ) - Please choose one**

Which of the following statement is true about dummy node of threaded binary tree?

- ▶ This dummy node never has a value.
- ▶ This dummy node has always some dummy value.
- ▶ **This dummy node has either no value or some dummy value. (Page 321)**
- ▶ This dummy node has always some integer value.

**Question No: 13 ( Marks: 1 ) - Please choose one**

For a perfect binary tree of height h, having N nodes, the sum of heights of nodes is

- ▶  $N - (h - 1)$
- ▶  **$N - (h + 1)$  (page 373)**
- ▶  $N - 1$
- ▶  $N - 1 + h$

**Question No: 14 ( Marks: 1 ) - Please choose one**

What is the best definition of a *collision* in a hash table?

- ▶ Two entries are identical except for their keys.
- ▶ Two entries with different data have the exact same key
- ▶ **Two entries with different keys have the same exact hash value. (page 464)**
- ▶ Two entries with the exact same key have different hash values.

**Question No: 15 ( Marks: 1 ) - Please choose one**

Which formula is the best approximation for the depth of a heap with n nodes?

- ▶  **$\log$  (base 2) of n (page 353)**
- ▶ The number of digits in n (base 10), e.g., 145 has three digits
- ▶ The square root of n
- ▶ n

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

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Which of the following statement is NOT correct about find operation:

- ▶ It is not a requirement that a find operation returns any specific name, just that finds on two elements return the same answer if and only if they are in the same set.
- ▶ **One idea might be to use a tree to represent each set, since each element in a tree has the same root, thus the root can be used to name the set.**
- ▶ Initially each set contains one element.
- ▶ Initially each set contains one element and it does not make sense to make a tree of one node only.

**Question No: 17 ( Marks: 1 ) - Please choose one**

Which of the following is not true regarding the maze generation?

- ▶ Randomly remove walls until the entrance and exit cells are in the same set.
- ▶ Removing a wall is the same as doing a union operation.
- ▶ **Remove a randomly chosen wall if the cells it separates are already in the same set. (page 424)**
- ▶ Do not remove a randomly chosen wall if the cells it separates are already in the same set.

**Question No: 18 ( Marks: 1 ) – Please choose one**

In threaded binary tree the NULL pointers are replaced by ,

- ▶ preorder successor or predecessor
- ▶ **inorder successor or predecessor (page 307)**
- ▶ postorder successor or predecessor
- ▶ NULL pointers are not replaced

**Question No: 19 ( Marks: 1 ) - Please choose one**

Which of the given option is NOT a factor in Union by Size:

- ▶ Maintain sizes (number of nodes) of all trees, and during union.
- ▶ Make smaller tree, the subtree of the larger one.
- ▶ **Make the larger tree, the subtree of the smaller one. (page 408)**
- ▶ Implementation: for each root node  $i$ , instead of setting  $parent[i]$  to  $-1$ , set it to  $-k$  if tree rooted at  $i$  has  $k$  nodes.

**Question No: 20 ( Marks: 1 ) - Please choose one**

Suppose we had a hash table whose hash function is “ $n \% 12$ ”, if the number 35 is already in the hash table, which of the following numbers would cause a collision?

- ▶ 144
- ▶ 145
- ▶ **143**
- ▶ 148

**Question No: 21 ( Marks: 1 ) - Please choose one**

What requirement is placed on an array, so that *binary search* may be used to locate an entry?

- ▶ The array elements must form a heap.
- ▶ The array must have at least 2 entries.
- ▶ **The array must be sorted. [Click here for detail](#)**
- ▶ The array's size must be a power of two

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 22 ( Marks: 1 ) - Please choose one**

A binary tree with 24 internal nodes has \_\_\_\_\_ external nodes.

- ▶ 22
- ▶ 23
- ▶ 48
- ▶ **25 (page 303)**

**Question No: 23 ( Marks: 1 ) - Please choose on**

In case of deleting a node from AVL tree, rotation could be prolong to the *root* node.

- ▶ **Yes (Page 267)**
- ▶ No

**Question No: 24 ( Marks: 1 ) - Please choose one**

when we have declared the size of the array, it is not possible to increase or decrease it during the \_\_\_\_\_ of the program.

- ▶ Declaration
- ▶ **Execution (page 17)**
- ▶ Defining
- ▶ None of the above

**Question No: 25 ( Marks: 1 ) - Please choose one**

it will be efficient to place stack elements at the start of the list because insertion and removal take \_\_\_\_\_ time.

- ▶ Variable
- ▶ **Constant (page 60)**
- ▶ Inconsistent
- ▶ None of the above

**Question No: 26 ( Marks: 1 ) - Please choose one**

\_\_\_\_\_ is the stack characteristic but \_\_\_\_\_ was implemented because of the size limitation of the array.

- ▶ isFull(),isEmpty()
- ▶ pop(), push()
- ▶ **isEmpty(), isFull() (page 59)**
- ▶ push(),pop()

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Spring 2010**

**Muhammad Moaaz Siddiq – MCS (2nd)**  
**mc100401285@Gmail.com**  
**Campus:- Institute of E-Learning & Modern**  
**Studies (IEMS) Samundari**

**Question No: 1 ( Marks: 1 ) - Please choose one**

What kind of list is best to answer questions such as "What is the item at position n?"

- ▶ **Lists implemented with an array.** [Click here for detail](#)
- ▶ Doubly-linked lists.
- ▶ Singly-linked lists.
- ▶ Doubly-linked or singly-linked lists are equally best

**Question No: 2 ( Marks: 1 ) - Please choose one**

Each node in doubly link list has,

- ▶ 1 pointer
- ▶ **2 pointers (page 39)**
- ▶ 3 pointers
- ▶ 4 pointers

**Question No: 3 ( Marks: 1 ) - Please choose one**

If there are 56 internal nodes in a binary tree then how many external nodes this binary tree will have?

- ▶ 54
- ▶ 55
- ▶ 56
- ▶ **57 (page 303)**

**Question No: 4 ( Marks: 1 ) - Please choose one**

If there are N internal nodes in a binary tree then what will be the no. of external nodes in this binary tree?

- ▶ N -1
- ▶ N
- ▶ **N +1 (page 303)**
- ▶ N +2

**Question No: 5 ( Marks: 1 ) - Please choose one**

A binary tree with N internal nodes has \_\_\_\_\_ links, \_\_\_\_\_ links to internal nodes and \_\_\_\_\_ links to external nodes

- ▶ N+1, 2N, N-1
- ▶ N+1, N-1, 2N
- ▶ **2N, N-1, N+1 (page 304)**
- ▶ N-1, 2N, N+1

**Question No: 6 ( Marks: 1 ) - Please choose one**

The definition of Transitivity property is

- ▶ For all element x member of S,  $x R x$
- ▶ For all elements x and y,  $x R y$  if and only if  $y R x$
- ▶ **For all elements x, y and z, if  $x R y$  and  $y R z$  then  $x R z$  (page 385)**
- ▶ For all elements w, x, y and z, if  $x R y$  and  $w R z$  then  $x R z$

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 7 ( Marks: 1 ) - Please choose one**

Which one of the following is not an example of equivalence relation:

- ▶ Electrical connectivity
- ▶ Set of people
- ▶ **<= relation (page 388)**
- ▶ Set of pixels

**Question No: 8 ( Marks: 1 ) - Please choose one**

Union is a \_\_\_\_\_ time operation.

- ▶ **Constant (page 405)**
- ▶ Polynomial
- ▶ Exponential
- ▶ None of the given options

**Question No: 9 ( Marks: 1 ) - Please choose one**

Binary Search is an algorithm of searching, used with the \_\_\_\_\_ data.

- ▶ **Sorted (page 432)**
- ▶ Unsorted
- ▶ Heterogeneous
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Merge sort and quick sort both fall into the same category of sorting algorithms. What is this category?

- ▶  $O(n \log n)$  sorts
- ▶ Interchange sort
- ▶ Average time is quadratic
- ▶ **None of the given options. (Page 488)**

**Question No: 12 ( Marks: 1 ) - Please choose one**

Huffman encoding uses \_\_\_\_\_ tree to develop codes of varying lengths for the letters used in the original message.

- ▶ Linked list
- ▶ Stack
- ▶ Queue
- ▶ **Binary tree (page 287)**

**Muhammad Moaaz Siddiq – MCS (2nd)**

**mc100401285@Gmail.com**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 13 ( Marks: 1 ) - Please choose one**

Which of the following statement is true about dummy node of threaded binary tree?

- ▶ The left pointer of dummy node points to the itself while the right pointer points to the root of tree.
- ▶ **The left pointer of dummy node points to the root node of the tree while the right pointer points itself i.e. to dummy node (page 321)**
- ▶ The left pointer of dummy node points to the root node of the tree while the right pointer is always NULL.
- ▶ The right pointer of dummy node points to the itself while the left pointer is always NULL.

**Question No: 14 ( Marks: 1 ) - Please choose one**

Consider a min heap, represented by the following array:

10,30,20,70,40,50,80,60

After inserting a node with value 31. Which of the following is the updated min heap?

- ▶ **10,30,20,31,40,50,80,60,70 (page 336)**
- ▶ 10,30,20,70,40,50,80,60,31
- ▶ 10,31,20,30,40,50,80,60,31
- ▶ 31,10,30,20,70,40,50,80,60

**Question No: 15 ( Marks: 1 ) - Please choose one**

Consider a min heap, represented by the following array:

11,22,33,44,55

After inserting a node with value 66. Which of the following is the updated min heap?

- ▶ **11,22,33,44,55,66 (page 336)**
- ▶ 11,22,33,44,66,55
- ▶ 11,22,33,66,44,55
- ▶ 11,22,66,33,44,55

**Question No: 16 ( Marks: 1 ) - Please choose one**

Suppose that a selection sort of 100 items has completed 42 iterations of the main loop. How many items are now guaranteed to be in their final spot (never to be moved again)?

- ▶ 21
- ▶ 41
- ▶ **42** [Click here for detail](#)
- ▶ 43

**Question No: 17 ( Marks: 1 ) - Please choose one**

\_\_\_\_\_ is a data structure that can grow easily dynamically at run time without having to copy existing elements.

- ▶ Array ()
- ▶ List
- ▶ **Both of these (page 10)**
- ▶ None of these

**Muhammad Moaaz Siddiq – MCS (2nd)**

**mc100401285@Gmail.com**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 18 ( Marks: 1 ) - Please choose one**

The maximum number of external nodes (leaves) for a binary tree of height H is \_\_\_\_\_

- ▶  $2^H$  [Click here for detail](#)
- ▶  $2^{H+1}$
- ▶  $2^H - 1$
- ▶  $2^{H+2}$

**Question No: 19 ( Marks: 1 ) - Please choose one**

A complete binary tree of height \_\_\_\_ has nodes between 16 to 31 .

- ▶ 2
- ▶ 3
- ▶ 4 (page 373)
- ▶ 5

**Question No: 20 ( Marks: 1 ) - Please choose one**

Which of the given option is NOT a factor in Union by Size:

- ▶ Maintain sizes (number of nodes) of all trees, and during union.
- ▶ Make smaller tree, the subtree of the larger one.
- ▶ **Make the larger tree, the subtree of the smaller one. (page 408)**
- ▶ Implementation: for each root node i, instead of setting parent[i] to -1, set it to -k if tree rooted at i has k nodes.

**Question No: 21 ( Marks: 1 ) - Please choose one**

Here is an array of ten integers:

5 3 8 9 1 7 0 2 6 4

The array after the FIRST iteration of the large loop in a selection sort (sorting from smallest to largest).

- ▶ 0 3 8 9 1 7 5 2 6 4 (Page 477)
- ▶ 2 6 4 0 3 8 9 1 7 5
- ▶ 2 6 4 9 1 7 0 3 8 5
- ▶ 0 3 8 2 6 4 9 1 7 5

**Question No: 22 ( Marks: 1 ) - Please choose one**

Suppose A is an array containing numbers in increasing order, but some numbers occur more than once when using a binary search for a value, the binary search always finds \_\_\_\_\_

- ▶ **the first occurrence of a value. [Click here for detail](#)**
- ▶ the second occurrence of a value.
- ▶ may find first or second occurrence of a value.
- ▶ None of the given options.

**Question No: 23 ( Marks: 1 ) - Please choose one**

A binary tree with 24 internal nodes has \_\_\_\_\_ external nodes.

- ▶ 22
- ▶ 23
- ▶ 48
- ▶ **25 (page 303)**

**Question No: 24 ( Marks: 1 ) - Please choose one**  
it will be efficient to place stack elements at the start of the list because insertion and removal take \_\_\_\_\_ time.

- ▶ Variable
- ▶ **Constant (page 60)**
- ▶ Inconsistent
- ▶ None of the above

**Question No: 25 ( Marks: 1 ) - Please choose one**  
“+” is a \_\_\_\_\_ operator.

- ▶ Unary
- ▶ **Binary (page 64)**
- ▶ Ternary
- ▶ None of the above

**Question No: 26 ( Marks: 1 ) - Please choose one**  
A kind of expressions where the operator is present between two operands called \_\_\_\_\_ expressions.

- ▶ Postfix
- ▶ **Infix (page 64)**
- ▶ Prefix
- ▶ None of the above.

**FINAL TERM EXAMINATION**  
Spring 2010

**Question No: 1 ( Marks: 1 ) - Please choose one**  
Here is a small function definition:

```
void f(int i, int &k)
{
i = 1;
k = 2;
}
```

Suppose that a main program has two integer variables x and y, which are given the value 0. Then the main program calls f(x,y); What are the values of x and y after the function f finishes?

- ▶ Both x and y are still 0.
- ▶ x is now 1, but y is still 0.
- ▶ **x is still 0, but y is now 2.**
- ▶ x is now 1, and y is now 2.

**Question No: 2 ( Marks: 1 ) - Please choose one**

A binary tree with N internal nodes has \_\_\_\_\_ links, \_\_\_\_\_ links to internal nodes and \_\_\_\_\_ links to external nodes

- ▶ N+1, 2N, N-1
- ▶ N+1, N-1, 2N
- ▶ **2N, N-1, N+1 (page 304)**
- ▶ N-1, 2N, N+1

**Question No: 3 ( Marks: 1 ) - Please choose one**

Each node in doubly link list has,

- ▶ 1 pointer
- ▶ **2 pointers (Page 39)**
- ▶ 3 pointers
- ▶ 4 pointers

**Question No: 4 ( Marks: 1 ) - Please choose one**

If you know the size of the data structure in advance, i.e., at compile time, which one of the following is a good data structure to use.

- ▶ Array
- ▶ List
- ▶ **Both of these (page 10)**
- ▶ None of these

**Question No: 5 ( Marks: 1 ) - Please choose one**

Which one of the following is not an example of equivalence relation:

- ▶ Electrical connectivity
- ▶ Set of people
- ▶  **$\leq$  relation (Page 388)**
- ▶ Set of pixels

**Question No: 6 ( Marks: 1 ) - Please choose one**

If a complete binary tree has height h then its no. of nodes will be,

- ▶ Log (h)
- ▶  **$2^{h+1} - 1$  (page 125)**
- ▶ Log (h) - 1
- ▶  $2^h - 1$

**Muhammad Moaaz Siddiq – MCS (2nd)**

**mc100401285@Gmail.com**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 7 ( Marks: 1 ) - Please choose one**

If a max heap is implemented using a partially filled array called data, and the array contains n elements ( $n > 0$ ), where is the entry with the greatest value? **Data[0] is correct**

- ▶ data[1]
- ▶ data[n-1]
- ▶ data[n]
- ▶ data[2\*n+1]

**Question No: 8 ( Marks: 1 ) - Please choose one**

Which one is a self-referential data type?

- ▶ Stack
- ▶ Queue
- ▶ [Link list](#) [Click here for detail](#)
- ▶ All of these

**Question No: 9 ( Marks: 1 ) - Please choose one**

There is/are \_\_\_\_\_ case/s for rotation in an AVL tree,

- ▶ 1
- ▶ 3
- ▶ 2
- ▶ **4 (page 229)**

**Question No: 10 ( Marks: 1 ) - Please choose one**

Which of the following can be the inclusion criteria for pixels in image segmentation.

- ▶ Pixel intensity
- ▶ Texture
- ▶ Threshold of intensity
- ▶ **All of the given options (page 421)**

**Question No: 11 ( Marks: 1 ) - Please choose one**

Consider the following array

23 15 5 12 40 10 7

After the first pass of a particular algorithm, the array looks like

15 5 12 23 10 7 40

Name the algorithm used

- ▶ Heap sort
- ▶ Selection sort
- ▶ Insertion sort
- ▶ **Bubble sort (According to rule)**

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 12 ( Marks: 1 ) - Please choose one**

In a perfectly balanced tree the insertion of a node needs \_\_\_\_\_ .

- ▶ **One rotation (Page 225)**
- ▶ Two rotations
- ▶ Rotations equal to number of levels
- ▶ No rotation at all

**Question No: 13 ( Marks: 1 ) - Please choose one**

If there are N elements in an array then the number of maximum steps needed to find an element using Binary Search is \_\_\_\_\_ .

- ▶ N
- ▶  $N^2$
- ▶  $N \log_2 N$
- ▶  **$\log_2 N$  (page 440)**

**Question No: 14 ( Marks: 1 ) - Please choose one**

Which of the following is NOT a correct statement about Table ADT.

- ▶ In a table, the type of information in columns may be different.
- ▶ **A table consists of several columns, known as entities. (page 408)**
- ▶ The row of a table is called a record.
- ▶ A major use of table is in databases where we build and use tables for keeping information.

**Question No: 15 ( Marks: 1 ) - Please choose one**

If both pointers of the node in a binary tree are NULL then it will be a/an \_\_\_\_\_ .

- ▶ Inner node
- ▶ **Leaf node (page 120)**
- ▶ Root node
- ▶ None of the given options

**Question No: 16 ( Marks: 1 ) - Please choose one**

Suppose we are sorting an array of eight integers using quick sort, and we have just finished the first partitioning with the array looking like this:

2 5 1 7 9 12 11 10

Which statement is correct?

- ▶ **The pivot could be either the 7 or the 9.(page 506)**
- ▶ The pivot could be the 7, but it is not the 9.
- ▶ The pivot is not the 7, but it could be the 9.
- ▶ Neither the 7 nor the 9 is the pivot.

**Muhammad Moaaz Siddiq – MCS (2nd)**

**mc100401285@Gmail.com**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 17 ( Marks: 1 ) - Please choose one**

What is the best definition of a *collision* in a hash table?

- ▶ Two entries are identical except for their keys.
- ▶ Two entries with different data have the exact same key
- ▶ **Two entries with different keys have the same exact hash value. (page 464)**
- ▶ Two entries with the exact same key have different hash values.

**Question No: 18 ( Marks: 1 ) - Please choose one**

For a perfect binary tree of height  $h$ , having  $N$  nodes, the sum of heights of nodes is

- ▶  $N - (h - 1)$
- ▶  **$N - (h + 1)$  (Page 373)**
- ▶  $N - 1$
- ▶  $N - 1 + h$

**Question No: 19 ( Marks: 1 ) - Please choose one**

A binary tree with 33 internal nodes has \_\_\_\_\_ links to internal nodes.

- ▶ 31
- ▶ **32 (Page 304)**
- ▶ 33
- ▶ 66

**Question No: 20 ( Marks: 1 ) - Please choose one**

Suppose you implement a Min heap (with the smallest element on top) in an array. Consider the different arrays below; determine the one that *cannot* possibly be a heap:

- ▶ 16, 18, 20, 22, 24, 28, 30
- ▶ 16, 20, 18, 24, 22, 30, 28
- ▶ 16, 24, 18, 28, 30, 20, 22
- ▶ **16, 24, 20, 30, 28, 18, 22 (see min heap property at page 337)**

**Question No: 21 ( Marks: 1 ) - Please choose one**

Which of the following is not true regarding the maze generation?

- ▶ Randomly remove walls until the entrance and exit cells are in the same set.
- ▶ Removing a wall is the same as doing a union operation.
- ▶ **Remove a randomly chosen wall if the cells it separates are already in the same set. (Page 424)**
- ▶ Do not remove a randomly chosen wall if the cells it separates are already in the same set.

**Question No: 22 ( Marks: 1 ) - Please choose one**

Which formula is the best approximation for the depth of a heap with  $n$  nodes?

▶ **log (base 2) of n (Page 353)**

- ▶ The number of digits in n (base 10), e.g., 145 has three digits
- ▶ The square root of n
- ▶ n

**Question No: 23 ( Marks: 1 ) - Please choose one**

In threaded binary tree the NULL pointers are replaced by ,

- ▶ preorder successor or predecessor
- ▶ **inorder successor or predecessor (Page 307)**
- ▶ postorder successor or predecessor
- ▶ NULL pointers are not replaced

**Question No: 24 ( Marks: 1 ) - Please choose one**

The \_\_\_\_\_ method of list will position the *currentNode* and *lastCurrentNode* at the start of the list.

- ▶ Remove
- ▶ Next
- ▶ **Start (Page 38)**
- ▶ Back

**Question No: 25 ( Marks: 1 ) - Please choose one**

Mergesort makes two recursive calls. Which statement is true after these recursive calls finish, but before the merge step?

- ▶ Elements in the first half of the array are less than or equal to elements in the second half of the array.
- ▶ None of the given options.
- ▶ The array elements form a heap.
- ▶ **Elements in the second half of the array are less than or equal to elements in the first half of the array.** [Click here for detail](#)

**Question No: 26 ( Marks: 1 ) - Please choose one**

Suppose we had a hash table whose hash function is “ $n \% 12$ ”, if the number 35 is already in the hash table, which of the following numbers would cause a collision?

- ▶ 144
- ▶ 145
- ▶ **143**
- ▶ 148

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

## FINAL TERM EXAMINATION

Fall 2009

### Question No: 1 ( Marks: 1 ) - Please choose one

The arguments passed to a function should match in number, type and order with the parameters in the function definition.

▶ True

▶ False

### Question No: 2 ( Marks: 1 ) - Please choose one

If numbers 5, 222, 4, 48 are inserted in a queue, which one will be removed first?

▶ 48

▶ 4

▶ 222

▶ **5 (According to rule)**

### Question No: 3 ( Marks: 1 ) - Please choose one

Suppose currentNode refers to a node in a linked list (using the Node class with member variables called data and nextNode). What statement changes currentNode so that it refers to the next node?

▶ currentNode ++;

▶ currentNode = nextNode;

▶ currentNode += nextNode;

▶ **currentNode = currentNode->nextNode;**

### Question No: 4 ( Marks: 1 ) - Please choose one

A **Compound Data Structure** is the data structure which can have multiple data items of same type or of different types. Which of the following can be considered compound data structure?

▶ Arrays

▶ LinkLists

▶ Binary Search Trees

▶ **All of the given options**      [Click here for detail](#)

### Question No: 5 ( Marks: 1 ) - Please choose one

Here is a small function definition:

```
void f(int i, int &k)
{
i = 1;
k = 2;
}
```

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

Suppose that a main program has two integer variables x and y, which are given the value 0. Then the main program calls f(x,y); What are the values of x and y after the function f finishes?

- ▶ Both x and y are still 0.
- ▶ x is now 1, but y is still 0.
- ▶ **x is still 0, but y is now 2.**
- ▶ x is now 1, and y is now 2.

**Question No: 6 ( Marks: 1 ) - Please choose one**

The difference between a binary tree and a binary search tree is that ,

- ▶ **a binary search tree has two children per node whereas a binary tree can have none, one, or two children per node** [Click here for detail](#)
- ▶ in binary search tree nodes are inserted based on the values they contain
- ▶ in binary tree nodes are inserted based on the values they contain
- ▶ none of these

**Question No: 7 ( Marks: 1 ) - Please choose one**

Compiler uses which one of the following to evaluate a mathematical equation,

- ▶ Binary Tree
- ▶ Binary Search Tree
- ▶ **Parse Tree (Page 274)**
- ▶ AVL Tree

**Question No: 8 ( Marks: 1 ) - Please choose one**

If there are 56 internal nodes in a binary tree then how many external nodes this binary tree will have?

- ▶ 54
- ▶ 55
- ▶ 56
- ▶ **57 (Page 303)**

**Question No: 9 ( Marks: 1 ) - Please choose one**

If there are 23 external nodes in a binary tree then what will be the no. of internal nodes in this binary tree?

- ▶ 23
- ▶ 24
- ▶ 21
- ▶ **22 (n-1) (Page 304)**

**Question No: 10 ( Marks: 1 ) - Please choose one**

Which of the following method is helpful in creating the heap at once?

- ▶ insert
- ▶ add
- ▶ update
- ▶ **preculateDown (Page 358)**

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 11 ( Marks: 1 ) - Please choose one**

The definition of Transitivity property is

- ▶ For all element  $x$  member of  $S$ ,  $x R x$
- ▶ For all elements  $x$  and  $y$ ,  $x R y$  if and only if  $y R x$
- ▶ **For all elements  $x, y$  and  $z$ , if  $x R y$  and  $y R z$  then  $x R z$  (Page 385)**
- ▶ For all elements  $w, x, y$  and  $z$ , if  $x R y$  and  $w R z$  then  $x R z$

**Question No: 12 ( Marks: 1 ) - Please choose one**

A binary tree of  $N$  nodes has \_\_\_\_\_.

- ▶  $\log_{10} N$  levels
- ▶  **$\log_2 N$  levels (Page 349)**
- ▶  $N / 2$  levels
- ▶  $N \times 2$  levels

**Question No: 13 ( Marks: 1 ) - Please choose one**

If there are  $N$  elements in an array then the number of maximum steps needed to find an element using Binary Search is \_\_\_\_\_.

- ▶  $N$
- ▶  $N^2$
- ▶  $N \log_2 N$
- ▶  **$\log_2 N$  (page 440)**

**Question No: 14 ( Marks: 1 ) - Please choose one**

Consider the following array

23 15 5 12 40 10 7

After the first pass of a particular algorithm, the array looks like

15 12 23 10 7 40

Name the algorithm used

- ▶ Heap sort
- ▶ Selection sort
- ▶ Insertion sort
- ▶ **Bubble sort**

**Question No: 15 ( Marks: 1 ) - Please choose one**

If both pointers of the node in a binary tree are NULL then it will be a/an \_\_\_\_\_.

- ▶ Inner node
- ▶ **Leaf node (Page 313)**
- ▶ Root node
- ▶ None of the given options

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 16 ( Marks: 1 ) - Please choose one**

By using \_\_\_\_\_ we avoid the recursive method of traversing a Tree, which makes use of stacks and consumes a lot of memory and time.

- ▶ Binary tree only
- ▶ **Threaded binary tree (page 306)**
- ▶ Heap data structure
- ▶ Huffman encoding

**Question No: 17 ( Marks: 1 ) - Please choose one**

A complete binary tree of height 3 has between \_\_\_\_\_ nodes.

- ▶ 8 to 14
- ▶ **8 to 15 (Page 124)**
- ▶ 8 to 16
- ▶ 8 to 17

$$2^{(d+1)} - 1 = 2^{(3+1)} - 1 = 2^4 - 1 = 16 - 1 = 15$$

**Question No: 18 ( Marks: 1 ) - Please choose one**

Consider a min heap, represented by the following array:

3,4,6,7,5,10

After inserting a node with value 1. Which of the following is the updated min heap?

- ▶ 3,4,6,7,5,10,1
- ▶ 3,4,6,7,5,1,10
- ▶ 3,4,1,5,7,10,6
- ▶ **1,4,3,5,7,10,6 close to correct but correct ans is 1,4,3,7,5,10,6 (page 337)**

**Question No: 19 ( Marks: 1 ) - Please choose one**

Consider a min heap, represented by the following array:

10,30,20,70,40,50,80,60

After inserting a node with value 31. Which of the following is the updated min heap?

- ▶ **10,30,20,31,40,50,80,60,70 (page 337)**
- ▶ 10,30,20,70,40,50,80,60,31
- ▶ 10,31,20,30,40,50,80,60,31
- ▶ 31,10,30,20,70,40,50,80,60

**Question No: 20 ( Marks: 1 ) - Please choose one**

Which one of the following algorithms is most widely used due to its good average time,

- ▶ Bubble Sort
- ▶ Insertion Sort
- ▶ **Quick Sort [Click here for detail](#)**
- ▶ Merge Sort

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 21 ( Marks: 1 ) - Please choose one**

Which of the following statement is correct about find(x) operation:

- ▶ A find(x) on element x is performed by returning exactly the same node that is found.
- ▶ **A find(x) on element x is performed by returning the root of the tree containing x.**

[Click here for detail](#)

- ▶ A find(x) on element x is performed by returning the whole tree itself containing x. (Page 10)
- ▶ A find(x) on element x is performed by returning TRUE.

**Question No: 22 ( Marks: 1 ) - Please choose one**

Which of the following statement is NOT correct about find operation:

- ▶ It is not a requirement that a find operation returns any specific name, just that finds on two elements return the same answer if and only if they are in the same set.
- ▶ **One idea might be to use a tree to represent each set, since each element in a tree has the same root, thus the root can be used to name the set.**
- ▶ Initially each set contains one element.
- ▶ Initially each set contains one element and it does not make sense to make a tree of one node only.

**Question No: 23 ( Marks: 1 ) - Please choose one**

The following are statements related to queues.

The last item to be added to a queue is the first item to be removed **False statement**

A queue is a structure in which both ends are not used **False statement**

The last element hasn't to wait until all elements preceding it on the queue are removed **False statement**

queue is said to be a last-in-first-out list or LIFO data structure. **False statement**

Which of the above is/are related to normal queues?

- ▶ (iii) and (ii) only
- ▶ (i), (ii) and (iv) only
- ▶ (ii) and (iv) only
- ▶ **None of the given options**

**Question No: 24 ( Marks: 1 ) - Please choose one**

The maximum number of external nodes (leaves) for a binary tree of height H is \_\_\_\_\_

- ▶  **$2^H$**  [Click here for detail](#)
- ▶  $2^H+1$
- ▶  $2^H-1$
- ▶  $2^H+2$

**Question No: 25 ( Marks: 1 ) - Please choose one**

In complete binary tree the bottom level is filled from \_\_\_\_\_

- ▶ **Left to right (Page 323)**
- ▶ Right to left
- ▶ Not filled at all
- ▶ None of the given options

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 26 ( Marks: 1 ) - Please choose one**

We are given N items to build a heap, this can be done with \_\_\_\_\_ successive inserts.

- ▶ N-1
- ▶ **N (Page 353)**
- ▶ N+1
- ▶ N<sup>2</sup>

**Question No: 27 ( Marks: 1 ) - Please choose one**

Suppose we had a hash table whose hash function is “n % 12”, if the number 35 is already in the hash table, which of the following numbers would cause a collision?

- ▶ 144
- ▶ 145
- ▶ **143**
- ▶ 148

**Question No: 28 ( Marks: 1 ) - Please choose one**

Here is an array of ten integers:

5 3 8 9 1 7 0 2 6 4

The array after the FIRST iteration of the large loop in a selection sort (sorting from smallest to largest).

- ▶ **0 3 8 9 1 7 5 2 6 4 (Page 477)**
- ▶ 2 6 4 0 3 8 9 1 7 5
- ▶ 2 6 4 9 1 7 0 3 8 5
- ▶ 0 3 8 2 6 4 9 1 7 5

**Question No: 29 ( Marks: 1 ) - Please choose one**

What requirement is placed on an array, so that *binary search* may be used to locate an entry?

- ▶ The array elements must form a heap.
- ▶ The array must have at least 2 entries.
- ▶ **The array must be sorted. [Click here for detail](#)**
- ▶ The array's size must be a power of two.

**Question No: 30 ( Marks: 1 ) - Please choose one**

In case of deleting a node from AVL tree, rotation could be prolonged to the *root* node.

- ▶ **Yes (Page 267)**
- ▶ No

## FINAL TERM EXAMINATION

Fall 2009

### Question No: 1 ( Marks: 1 ) - Please choose one

\_\_\_\_\_ only removes items in reverse order as they were entered.

- ▶ **Stack (Page 81)**
- ▶ Queue
- ▶ Both of these
- ▶ None of these

### Question No: 2 ( Marks: 1 ) - Please choose one

Here is a small function definition:

```
void f(int i, int &k)
{
  i = 1;
  k = 2;
}
```

Suppose that a main program has two integer variables x and y, which are given the value 0. Then the main program calls f(x,y); What are the values of x and y after the function f finishes?

- ▶ Both x and y are still 0.
- ▶ x is now 1, but y is still 0.
- ▶ **x is still 0, but y is now 2.**
- ▶ x is now 1, and y is now 2.

### Question No: 3 ( Marks: 1 ) - Please choose one

Select the one *FALSE* statement about binary trees:

- ▶ **Every binary tree has at least one node. (Page 113)**
- ▶ Every non-empty tree has exactly one root node.
- ▶ Every node has at most two children.
- ▶ Every non-root node has exactly one parent.

### Question No: 4 ( Marks: 1 ) - Please choose one

Every AVL is \_\_\_\_\_

- ▶ Binary Tree
- ▶ Complete Binary Tree
- ▶ None of these
- ▶ **Binary Search Tree**     [Click here for detail](#)

### Question No: 5 ( Marks: 1 ) - Please choose one

Searching an element in an AVL tree take maximum \_\_\_\_\_ time (where n is no. of nodes in AVL tree),

- ▶  $\log_2(n+1)$
- ▶  $\log_2(n+1) - 1$
- ▶  **$1.44 \log_2 n$  (Page 227)**
- ▶  $1.66 \log_2 n$

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@gmail.com](mailto:mc100401285@gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 6 ( Marks: 1 ) - Please choose one**

Suppose that we have implemented a *priority queue* by storing the items in a heap. We are now executing a reheapification downward and the out-of-place node has priority of 42. The node's parent has a priority of 72, the left child has priority 52 and the node's right child has priority 62. Which statement best describes the status of the reheapification.

- ▶ The reheapification is done.
- ▶ The next step will interchange the two children of the out-of-place node.
- ▶ The next step will swap the out-of-place node with its parent.
- ▶ The next step will swap the out-of-place node with its left child.

**Question No: 7 ( Marks: 1 ) - Please choose one**

Suppose you implement a heap (with the largest element on top) in an array. Consider the different arrays below, determine the one that *cannot* possibly be a heap:

- ▶ 7 6 5 4 3 2 1
- ▶ 7 3 6 2 1 4 5
- ▶ 7 6 4 3 5 2 1
- ▶ **7 3 6 4 2 5 1**

According to max heap property

**Question No: 8 ( Marks: 1 ) - Please choose one**

If there are 23 external nodes in a binary tree then what will be the no. of internal nodes in this binary tree?

- ▶ 23
- ▶ 24
- ▶ 21
- ▶ **22 (N-1)**

**Question No: 9 ( Marks: 1 ) - Please choose one**

If there are N external nodes in a binary tree then what will be the no. of internal nodes in this binary tree?

- ▶ **N -1 (Page 304)**
- ▶ N+1
- ▶ N+2
- ▶ N

**Question No: 10 ( Marks: 1 ) - Please choose one**

Which one of the following is NOT the property of equivalence relation:

- ▶ Reflexive
- ▶ Symmetric
- ▶ Transitive
- ▶ **Associative (Page 385)**

**Muhammad Moaaz Siddiq – MCS (2nd)**

**mc100401285@Gmail.com**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 11 ( Marks: 1 ) - Please choose one**

The definition of Transitivity property is

- ▶ For all element  $x$  member of  $S$ ,  $x R x$
- ▶ For all elements  $x$  and  $y$ ,  $x R y$  if and only if  $y R x$
- ▶ **For all elements  $x$ ,  $y$  and  $z$ , if  $x R y$  and  $y R z$  then  $x R z$  (Page 385)**
- ▶ For all elements  $w$ ,  $x$ ,  $y$  and  $z$ , if  $x R y$  and  $w R z$  then  $x R z$

**Question No: 12 ( Marks: 1 ) - Please choose one**

Union is a \_\_\_\_\_ time operation.

- ▶ **Constant ( Page 120)**
- ▶ Polynomial
- ▶ Exponential
- ▶ None of the given option

**Question No: 13 ( Marks: 1 ) - Please choose one**

Which of the following is NOT a correct statement about Table ADT.

- ▶ In a table, the type of information in columns may be different. yes
- ▶ **A table consists of several columns, known as entities. (Page 408 )**
- ▶ The row of a table is called a record.
- ▶ A major use of table is in databases where we build and use tables for keeping information.

**Question No: 14 ( Marks: 1 ) - Please choose one**

In the worst case of deletion in AVL tree requires \_\_\_\_\_.

- ▶ Only one rotation
- ▶ Rotation at each non-leaf node
- ▶ Rotation at each leaf node
- ▶ **Rotations equal to  $\log_2 N$  (Page 441)**

**Question No: 15 ( Marks: 1 ) - Please choose on**

Binary Search is an algorithm of searching, used with the \_\_\_\_\_ data.

- ▶ **Sorted (Page 432)**
- ▶ Unsorted
- ▶ Heterogeneous
- ▶ Random

**Question No: 16 ( Marks: 1 ) - Please choose on**

Which of the following statement is correct?

- ▶ A Threaded Binary Tree is a binary tree in which every node that does not have a left child has a THREAD (in actual sense, a link) to its INORDER successor.
- ▶ A Threaded Binary Tree is a binary tree in which every node that does not have a right child has a THREAD (in actual sense, a link) to its PREORDER successor.
- ▶ **A Threaded Binary Tree is a binary tree in which every node that does not have a right child has a THREAD (in actual sense, a link) to its INORDER successor. (Page 307)**
- ▶ A Threaded Binary Tree is a binary tree in which every node that does not have a right child has a THREAD (in actual sense, a link) to its POSTORDER successor.

**Muhammad Moaaz Siddiq – MCS (2nd)**

**mc100401285@Gmail.com**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 17 ( Marks: 1 ) - Please choose one**

By using \_\_\_\_\_ we avoid the recursive method of traversing a Tree, which makes use of stacks and consumes a lot of memory and time.

- ▶ Binary tree only
- ▶ **Threaded binary tree (page 306)**
- ▶ Heap data structure
- ▶ Huffman encoding

**Question No: 18 ( Marks: 1 ) - Please choose one**

Which of the following statement is NOT true about threaded binary tree?

- ▶ Right thread of the right-most node points to the *dummy* node.
- ▶ Left thread of the left-most node points to the *dummy* node.
- ▶ The left pointer of dummy node points to the root node of the tree.
- ▶ **Left thread of the right-most node points to the *dummy* node. (page 321)**

**Question No: 19 ( Marks: 1 ) - Please choose one**

Consider a min heap, represented by the following array:

11,22,33,44,55

After inserting a node with value 66. Which of the following is the updated min heap?

- ▶ **11,22,33,44,55,66 (page 337)**
- ▶ 11,22,33,44,66,55
- ▶ 11,22,33,66,44,55
- ▶ 11,22,66,33,44,55

**Question No: 20 ( Marks: 1 ) - Please choose one**

Consider a min heap, represented by the following array:

3,4,6,7,5

After calling the function deleteMin(). Which of the following is the updated min heap?

- ▶ 4,6,7,5
- ▶ 6,7,5,4
- ▶ **4,5,6,7 (page 349)**
- ▶ 4,6,5,7

**Question No: 21 ( Marks: 1 ) - Please choose one**

We can build a heap in \_\_\_\_\_ time.

- ▶ **Linear (Page 353)**
- ▶ Exponential
- ▶ Polynomial
- ▶ None of the given options

**Muhammad Moaaz Siddiq – MCS (2nd)**

**mc100401285@Gmail.com**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 22 ( Marks: 1 ) - Please choose one**

Suppose we are sorting an array of eight integers using quick sort, and we have just finished the first partitioning with the array looking like this:

2 5 1 7 9 12 11 10

Which statement is correct?

- ▶ **The pivot could be either the 7 or the 9. (page 506)**
- ▶ The pivot could be the 7, but it is not the 9.
- ▶ The pivot is not the 7, but it could be the 9
- ▶ Neither the 7 nor the 9 is the pivot.

**Question No: 23 ( Marks: 1 ) - Please choose one**

Which formula is the best approximation for the depth of a heap with n nodes?

- ▶ **log (base 2) of n (Page 353)**
- ▶ The number of digits in n (base 10), e.g., 145 has three digits
- ▶ The square root of n
- ▶ n

**Question No: 24 ( Marks: 1 ) - Please choose one**

Suppose you implement a Min heap (with the smallest element on top) in an array. Consider the different arrays below; determine the one that *cannot* possibly be a heap:

- ▶ 16, 18, 20, 22, 24, 28, 30
- ▶ 16, 20, 18, 24, 22, 30, 28
- ▶ 16, 24, 18, 28, 30, 20, 22
- ▶ **16, 24, 20, 30, 28, 18, 22** **It's not satisfy the min heap property.**

**Question No: 25 ( Marks: 1 ) - Please choose one**

While joining nodes in the building of Huffman encoding tree if there are more nodes with same frequency, we choose the nodes \_\_\_\_\_.

- ▶ **Randomly (Page 289)**
- ▶ That occur first in the text message
- ▶ That are lexically smaller among others.
- ▶ That are lexically greater among others

**Question No: 26 ( Marks: 1 ) - Please choose one**

Consider the following paragraph with blanks.

A ..... is a linear list where ..... and ..... take place at the same end . This end is called the .....

What would be the correct filling the above blank positions?

- ▶ (i) queue (ii) insertion (iii) removals (iv) top
- ▶ (i) stack (ii) insertion (iii) removals (iv) bottom
- ▶ **(i) stack (ii) insertion (iii) removals (iv) top (Page 52)**
- ▶ (i) tree (ii) insertion (iii) removals (iv) top

**Muhammad Moaaz Siddiq – MCS (2nd)**

**mc100401285@Gmail.com**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 27 ( Marks: 1 ) - Please choose one**

A binary tree with 33 internal nodes has \_\_\_\_\_ links to internal nodes.

- ▶ 31
- ▶ **32 (n-1 links to internal nodes) (Page 304)**
- ▶ 33
- ▶ 66

**Question No: 28 ( Marks: 1 ) - Please choose on**

Which traversal gives a decreasing order of elements in a heap where the max element is stored at the top?

- ▶ post-order
- ▶ level-order
- ▶ inorder
- ▶ **None of the given options**

**Question No: 29 ( Marks: 1 ) - Please choose one**

What requirement is placed on an array, so that *binary search* may be used to locate an entry

- ▶ The array elements must form a heap.
- ▶ The array must have at least 2 entries.
- ▶ **The array must be sorted** [Click here for detail](#)
- ▶ The array's size must be a power of two.

**Question No: 30 ( Marks: 1 ) - Please choose one**

Which of the following is a non linear data structure?

- ▶ Linked List
- ▶ Stack
- ▶ Queue
- ▶ **Tree (Page 112)**

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**Question No: 1 ( Marks: 1 ) - Please choose one**

The data of the problem is of 2GB and the hard disk is of 1GB capacity, to solve this problem we should

- ▶ Use better data structures
- ▶ **Increase the hard disk space (Page 5)**
- ▶ Use the better algorithm
- ▶ Use as much data as we can store on the hard disk

**Question No: 2 ( Marks: 1 ) - Please choose one**

In an array list the current element is

- ▶ **The first element** [Click here for detail](#)

- ▶ The middle element
- ▶ The last element
- ▶ The element where the current pointer points to

**Question No: 3 ( Marks: 1 ) - Please choose one**

Which one of the following is a valid postfix expression?

- ▶  $ab+c*d-$
- ▶  **$abc*+d-$  (According to rule)**
- ▶  $abc+*d-$
- ▶  $(abc*)+d-$

**Question No: 4 ( Marks: 1 ) - Please choose one**

In sequential access data structure, accessing any element in the data structure takes different amount of time. Tell which one of the following is sequential access data structure,

- ▶ Arrays
- ▶ **Lists** [Click here for detail](#)
- ▶ Both of these
- ▶ None of these

**Question No: 5 ( Marks: 1 ) - Please choose one**

I have implemented the queue with a circular array. If data is a circular array of CAPACITY elements, and last is an index into that array, what is the formula for the index after last?

- ▶  $(last \% 1) + CAPACITY$
- ▶  $last \% (1 + CAPACITY)$
- ▶  **$(last + 1) \% CAPACITY$**
- ▶  $last + (1 \% CAPACITY)$

**This expression will point to field after last that will be the first field.**

**Question No: 6 ( Marks: 1 ) - Please choose one**

Which one of the following is TRUE about recursion?

- ▶ **Recursion extensively uses stack memory. (page 149)**
- ▶ Threaded Binary Trees use the concept of recursion.
- ▶ Recursive function calls consume a lot of memory.
- ▶ Iteration is more efficient than iteration.

**Question No: 7 ( Marks: 1 ) - Please choose one**

Compiler uses which one of the following to evaluate a mathematical equation,

- ▶ Binary Tree
- ▶ Binary Search Tree
- ▶ **Parse Tree (Page 274)**
- ▶ AVL Tree

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 8 ( Marks: 1 ) - Please choose one**

Which one of the following is TRUE about iteration?

- ▶ Iteration extensively uses stack memory.
- ▶ Threaded Binary Trees use the concept of iteration.
- ▶ Iterative function calls consumes a lot of memory.
- ▶ **Recursion is more efficient than iteration. [Click here for detail](#)**

**Question No: 9 ( Marks: 1 ) - Please choose one**

If a max heap is implemented using a partially filled array called data, and the array contains n elements ( $n > 0$ ), where is the entry with the greatest value? **Data[0] is correct**

- ▶ data[1]
- ▶ data[n-1]
- ▶ data[n]
- ▶ data[2\*n+1]

**Question No: 10 ( Marks: 1 ) - Please choose one**

If there are 56 internal nodes in a binary tree then how many external nodes this binary tree will have?

- ▶ 54
- ▶ 55
- ▶ 56
- ▶ **57 (n+1)**

**Question No: 11 ( Marks: 1 ) - Please choose one**

Which of the following heap method increase the value of key at position 'p' by the amount 'delta'?

- ▶ **increaseKey(p,delta) (Page 363)**
- ▶ decreaseKey(p,delta)
- ▶ preculcateDown(p,delta)
- ▶ remove(p,delta)

**Question No: 12 ( Marks: 1 ) - Please choose one**

If we have 1000 sets each containing a single different person. Which of the following relation will be true on each set:

- ▶ **Reflexive (page 387)**
- ▶ Symmetric
- ▶ Transitive
- ▶ Associative

**Question No: 13 ( Marks: 1 ) - Please choose one**

Which one of the following is not an example of equivalence relation:

- ▶ Electrical connectivity
- ▶ Set of people
- ▶ **<= relation (Page 388)**
- ▶ Set of pixels

**Question No: 14 ( Marks: 1 ) - Please choose one**

A binary tree of N nodes has \_\_\_\_\_.

- ▶  $\text{Log}_{10} N$  levels
- ▶  **$\text{Log}_2 N$  levels (Page 212)**
- ▶  $N / 2$  levels
- ▶  $N \times 2$  levels

**Question No: 15 ( Marks: 1 ) <http://vustudents.ning.com> - Please choose one**

Binary Search is an algorithm of searching, used with the \_\_\_\_\_ data.

- ▶ **Sorted (Page 432)**
- ▶ Unsorted
- ▶ Heterogeneous
- ▶ Random

**Question No: 16 ( Marks: 1 ) - Please choose one**

Consider the following array

23 15 5 12 40 10 7

After the first pass of a particular algorithm, the array looks like

15 5 12 23 10 7 40

Name the algorithm used

- ▶ Heap sort
- ▶ Selection sort
- ▶ Insertion sort
- ▶ **Bubble sort (According to rule)**

**Question No: 17 ( Marks: 1 ) - Please choose one**

Which of the following statements is correct property of binary trees?

- ▶ A binary tree with N internal nodes has N+1 internal links.
- ▶ A binary tree with N external nodes has 2N internal nodes.
- ▶ **A binary tree with N internal nodes has N+1 external nodes. (page 304)**
- ▶ None of above statement is a property of the binary tree.

**Question No: 18 ( Marks: 1 ) - Please choose one**

Which of the following is a property of binary tree?

- ▶ A binary tree of N external nodes has N internal node.
- ▶ **A binary tree of N internal nodes has N+ 1 external node. (Page 304)**
- ▶ A binary tree of N external nodes has N+ 1 internal node.
- ▶ A binary tree of N internal nodes has N- 1 external node.

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@gmail.com](mailto:mc100401285@gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 19 ( Marks: 1 ) - Please choose one**

Which of the following statement is true about dummy node of threaded binary tree?

- ▶ The left pointer of dummy node points to the itself while the right pointer points to the root of tree.
- ▶ **The left pointer of dummy node points to the root node of the tree while the right pointer points itself i.e. to dummy node (Page 321)**
- ▶ The left pointer of dummy node points to the root node of the tree while the right pointer is always NULL.
- ▶ The right pointer of dummy node points to the itself while the left pointer is always NULL.

**Question No: 20 ( Marks: 1 ) - Please choose one**

If the bottom level of a binary tree is NOT completely filled, depicts that the tree is NOT a

- ▶ Expression tree
- ▶ Threaded binary tree
- ▶ **complete Binary tree (Page 323)**
- ▶ Perfectly complete Binary tree

**Question No: 21 ( Marks: 1 ) - Please choose one**

In a selection sort of n elements, how many times the swap function is called to complete the execution of the algorithm?

- ▶ **n-1** [Click here for detail](#)
- ▶ n log n
- ▶ n<sup>2</sup>
- ▶ 1

**Question No: 22 ( Marks: 1 ) - Please choose one**

Which of the following statement is correct about find(x) operation:

- ▶ A find(x) on element x is performed by returning exactly the same node that is found.
- ▶ **A find(x) on element x is performed by returning the root of the tree containing x. [Click here for detail](#)**
- ▶ A find(x) on element x is performed by returning the whole tree itself containing x.
- ▶ A find(x) on element x is performed by returning TRUE.

**Question No: 23 ( Marks: 1 ) - Please choose one**

Which of the following statement is NOT correct about find operation:

- ▶ It is not a requirement that a find operation returns any specific name, just that finds on two elements return the same answer if and only if they are in the same set.
- ▶ **One idea might be to use a tree to represent each set, since each element in a tree has the same root, thus the root can be used to name the set.**
- ▶ Initially each set contains one element.
- ▶ **Initially** each set contains one element and it does not make sense to make a tree of one node only.

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 24 ( Marks: 1 ) - Please choose one**

Consider the following postfix expression S and the initial values of the variables.

$$S = A B - C + D E F - + ^$$

Assume that A=3, B=2, C=1, D=1, E=2, F=3

What would be the final output of the stack?

- ▶ 1 [Click here for detail](#)
- ▶ 2
- ▶ 0
- ▶ -1

**Question No: 25 ( Marks: 1 ) - Please choose one**

The maximum number of external nodes (leaves) for a binary tree of height H is \_\_\_\_\_

- ▶  $2^H$  [Click here for detail](#)
- ▶  $2^H + 1$
- ▶  $2^H - 1$
- ▶  $2^H + 2$

**Question No: 26 ( Marks: 1 ) - Please choose one**

In threaded binary tree the NULL pointers are replaced by ,

- ▶ preorder successor or predecessor
- ▶ **inorder successor or predecessor (Page 307)**
- ▶ postorder successor or predecessor
- ▶ NULL pointers are not replaced

**Question No: 27 ( Marks: 1 ) - Please choose one**

In a min heap , preculcateDown procedure will move smaller value\_\_\_\_\_ and bigger value\_\_\_\_\_.

- ▶ left,right
- ▶ right,left
- ▶ **up,down (Page 358)**
- ▶ down,up

**Question No: 28 ( Marks: 1 ) - Please choose one**

Which of the following statement is correct about union:

- ▶ **To perform Union of two sets, we merge the two trees by making the root of one tree point to the root of the other. (Greedy algorithms , Page 7)**
- ▶ To perform Union of two sets, we merge the two trees by making the leaf node of one tree point to the root of the other.
- ▶ To perform Union of two sets, merging operation of trees in not required at all.
- ▶ None of the given options.

**Muhammad Moaaz Siddiq – MCS (2nd)**

**mc100401285@Gmail.com**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 29 ( Marks: 1 ) - Please choose one**

Suppose A is an array containing numbers in increasing order, but some numbers occur more than once when using a binary search for a value, the binary search always finds \_\_\_\_\_

- ▶ **the first occurrence of a value.**      [Click here for detail](#)
- ▶ the second occurrence of a value.
- ▶ may find first or second occurrence of a value.
- ▶ None of the given options.

**Question No: 30 ( Marks: 1 ) - Please choose one**

Let heap stored in an array as H = [50, 40, 37, 32, 28, 22, 36, 13]. In other words, the root of the heap contains the maximum element. What is the result of deleting 40 from this heap

- ▶ **[50,32, 37,13, 28, 22, 36] according to max heap property.**
- ▶ [37, 28, 32, 22, 36, 13]
- ▶ [37, 36, 32, 28, 13, 22]
- ▶ [37, 32, 36, 13, 28, 22]

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**Question No: 1 ( Marks: 1 ) - Please choose one**

In an array we can store data elements of different types.

- ▶ True
- ▶ **False**

**Question No: 2 ( Marks: 1 ) - Please choose one**

Which one of the following statement is NOT correct .

- ▶ In linked list the elements are necessarily to be contiguous
- ▶ **In linked list the elements may locate at far positions in the memory (page 18)**
- ▶ In linked list each element also has the address of the element next to it
- ▶ In an array the elements are contiguous

**Question No: 3 ( Marks: 1 ) - Please choose one**

Doubly Linked List always has one NULL pointer.

- ▶ True
- ▶ **False(page 39)**

**Question No: 4 ( Marks: 1 ) - Please choose one**

A queue is a data structure where elements are,

- ▶ inserted at the front and removed from the back. .(see example at page #89 nd 90)
- ▶ inserted and removed from the top.
- ▶ inserted at the back and removed from the front.
- ▶ inserted and removed from both ends.

**Question No: 5 ( Marks: 1 ) - Please choose one**

Each node in doubly link list has,

- ▶ 1 pointer
- ▶ **2 pointers(page 39)**
- ▶ 3 pointers
- ▶ 4 pointers

**Question No: 6 ( Marks: 1 ) - Please choose one**

I have implemented the queue with a linked list, keeping track of a front pointer and a rear pointer. Which of these pointers will change during an insertion into an *EMPTY* queue?

- ▶ Neither changes
- ▶ Only front pointer changes.
- ▶ Only rear pointer changes.
- ▶ **Both change.**

Since it is an empty queue the front and rear are initialize to -1, so on insertion both the pointers will change and point to 0.

**Question No: 7 ( Marks: 1 ) - Please choose one**

Compiler uses which one of the following to evaluate a mathematical equation,

- ▶ Binary Tree
- ▶ Binary Search Tree
- ▶ **Parse Tree(page 274)**
- ▶ AVL Tree

**Question No: 8 ( Marks: 1 ) - Please choose one**

If a complete binary tree has n number of nodes then its height will be,

▶  **$\log_2(n+1) - 1$ (page 139)**

- ▶  $2^n$
- ▶  $\log_2(n) - 1$
- ▶  $2^n - 1$

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@gmail.com](mailto:mc100401285@gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 9 ( Marks: 1 ) - Please choose one**

If a complete binary tree has height  $h$  then its no. of nodes will be,

- ▶ Log ( $h$ )
- ▶  $2^{h+1} - 1$  (page 324)
- ▶ Log ( $h$ ) - 1
- ▶  $2^h - 1$

**Question No: 10 ( Marks: 1 ) <http://vustudents.ning.com> - Please choose one**

A binary relation  $R$  over  $S$  is called an equivalence relation if it has following property(s)

- ▶ Reflexivity
- ▶ Symmetry
- ▶ Transitivity
- ▶ All of the given options (page 387)

**Question No: 11 ( Marks: 1 ) - Please choose one**

Binary Search is an algorithm of searching, used with the \_\_\_\_\_ data.

- ▶ Sorted (page 432)
- ▶ Unsorted
- ▶ Heterogeneous
- ▶ Random

**Question No: 12 ( Marks: 1 ) - Please choose one**

If there are  $N$  elements in an array then the number of maximum steps needed to find an element using Binary Search is \_\_\_\_\_ .

- ▶  $N$
- ▶  $N^2$
- ▶  $N \log_2 N$
- ▶  $\log_2 N$  (page 440)

**Question No: 13 ( Marks: 1 ) - Please choose one**

Use of binary tree in compression of data is known as \_\_\_\_\_ .

- ▶ Traversal
- ▶ Heap
- ▶ Union
- ▶ Huffman encoding (page 287)

**Question No: 14 ( Marks: 1 ) - Please choose one**

While building Huffman encoding tree the new node that is the result of joining two nodes has the frequency.

- ▶ Equal to the small frequency
- ▶ Equal to the greater
- ▶ Equal to the sum of the two frequencies (page 293)
- ▶ Equal to the difference of the two frequencies

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@gmail.com](mailto:mc100401285@gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

**Question No: 15 ( Marks: 1 ) - Please choose one**

Which of the following statements is correct property of binary trees?

- ▶ A binary tree with N internal nodes has N+1 internal links.
- ▶ A binary tree with N external nodes has 2N internal nodes.
- ▶ **A binary tree with N internal nodes has N+ 1 external node. (page 303)**
- ▶ None of above statement is a property of the binary tree.

**Question No: 16 ( Marks: 1 ) - Please choose one**

Which of the following is a property of binary tree?

- ▶ A binary tree of N external nodes has N internal node.
- ▶ **A binary tree of N internal nodes has N+ 1 external node. (page 303)**
- ▶ A binary tree of N external nodes has N+ 1 internal node.
- ▶ A binary tree of N internal nodes has N- 1 external node.

**Question No: 17 ( Marks: 1 ) - Please choose one**

Which of the following statement is correct?

- ▶ A Threaded Binary Tree is a binary tree in which every node that does not have a left child has a THREAD (in actual sense, a link) to its INORDER successor.
- ▶ A Threaded Binary Tree is a binary tree in which every node that does not have a right child has a THREAD (in actual sense, a link) to its PREOREDR successor.
- ▶ **A Threaded Binary Tree is a binary tree in which every node that does not have a right child has a THREAD (in actual sense, a link) to its INORDER successor. (Page 307)**
- ▶ A Threaded Binary Tree is a binary tree in which every node that does not have a right child has a THREAD (in actual sense, a link) to its POSTORDER successor.

**Question No: 18 ( Marks: 1 ) - Please choose one**

Which of the following statement is correct?

- ▶ A Threaded Binary Tree is a binary tree in which every node that does not have a left child has a THREAD (in actual sense, a link) to its INORDER successor.
- ▶ A Threaded Binary Tree is a binary tree in which every node that does not have a right child has a THREAD (in actual sense, a link) to its PREOREDR successor.
- ▶ **A Threaded Binary Tree is a binary tree in which every node that does not have a left child has a THREAD (in actual sense, a link) to its INORDER predecessor.**
- ▶ A Threaded Binary Tree is a binary tree in which every node that does not have a right child has a THREAD (in actual sense, a link) to its POSTORDER predecessor.

**Question No: 19 ( Marks: 1 ) - Please choose one**

A Threaded Binary Tree is a binary tree in which every node that does not have a right child has a THREAD (in actual sense, a link) to its \_\_\_\_\_ successor.

- ▶ levelorder
- ▶ Preorder

**Muhammad Moaaz Siddiq – MCS (2nd)**

**mc100401285@Gmail.com**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

▶ **Inorder**     [Click here for detail](#)

▶ Postorder

**Question No: 20 ( Marks: 1 ) - Please choose one**

Which of the following statement is true about dummy node of threaded binary tree?

- ▶ This dummy node never has a value.
- ▶ This dummy node has always some dummy value.
- ▶ **This dummy node has either no value or some dummy value. .(page 321)**
- ▶ This dummy node has always some integer value.

**Question No: 21 ( Marks: 1 ) - Please choose one**

A complete binary tree is a tree that is \_\_\_\_\_ filled, with the possible exception of the bottom level.

- ▶ partially
- ▶ **completely (page 323)**
- ▶ incompletely
- ▶ partly

**Question No: 22 ( Marks: 1 ) - Please choose one**

A complete binary tree of height 3 has between \_\_\_\_\_ nodes.

- ▶ 8 to 14
- ▶ **8 to 15 (page 124)**
- ▶ 8 to 16
- ▶ 8 to 17

**Question No: 23 ( Marks: 1 ) - Please choose one**

We can build a heap in \_\_\_\_\_ time.

- ▶ **Linear (page 353)**
- ▶ Exponential
- ▶ Polynomial
- ▶ None of the given options

**Question No: 24 ( Marks: 1 ) - Please choose one**

Suppose that a selection sort of 100 items has completed 42 iterations of the main loop. How many items are now guaranteed to be in their final spot (never to be moved again)?

- ▶ 21
- ▶ 41
- ▶ **42**     [Click here for detail](#)
- ▶ 43

**Question No: 25 ( Marks: 1 ) - Please choose one**

Suppose you implement a Min heap (with the smallest element on top) in an array. Consider the different arrays below; determine the one that *cannot* possibly be a heap:

- ▶ 16, 18, 20, 22, 24, 28, 30

**Muhammad Moaaz Siddiq – MCS (2nd)**

**[mc100401285@Gmail.com](mailto:mc100401285@Gmail.com)**

**Campus:- Institute of E-Learning & Modern  
Studies (IEMS) Samundari**

- ▶ 16, 20, 18, 24, 22, 30, 28
- ▶ 16, 24, 18, 28, 30, 20, 22
- ▶ **16, 24, 20, 30, 28, 18, 22**      **It's not satisfy the min heap property**

**Question No: 26 ( Marks: 1 ) - Please choose one**

Which of the following statement is NOT correct about find operation:

- ▶ It is not a requirement that a find operation returns any specific name, just that finds on two elements return the same answer if and only if they are in the same set.
- ▶ **One idea might be to use a tree to represent each set, since each element in a tree has the same root, thus the root can be used to name the set.**
- ▶ Initially each set contains one element.
- ▶ Initially each set contains one element and it does not make sense to make a tree of one node only.

**Question No: 27 ( Marks: 1 ) - Please choose one**

Consider the following infix expression:

$$x - y * a + b / c$$

Which of the following is a correct equivalent expression(s) for the above?

- ▶  $x y - a * b + c /$
- ▶  $x * y a - b c / +$
- ▶  **$x y a * - b c / +$**       **Hint :-  $(x - y * a) + (b / c)$**
- ▶  $x y a * - b / + c$

**Question No: 28 ( Marks: 1 ) - Please choose one**

A complete binary tree of height \_\_\_\_\_ has nodes between 16 to 31 .

- ▶ 2
- ▶ 3
- ▶ **4 (page 124)**
- ▶ 5

**Question No: 29 ( Marks: 1 ) - Please choose one**

Here is an array of ten integers:

5 3 8 9 1 7 0 2 6 4

The array after the FIRST iteration of the large loop in a selection sort (sorting from smallest to largest).

- ▶ **0 3 8 9 1 7 5 2 6 4 (Page 477)**
- ▶ 2 6 4 0 3 8 9 1 7 5
- ▶ 2 6 4 9 1 7 0 3 8 5
- ▶ 0 3 8 2 6 4 9 1 7 5

**Question No: 30 ( Marks: 1 ) - Please choose one**

What requirement is placed on an array, so that *binary search* may be used to locate an entry?

- ▶ The array elements must form a heap.

- ▶ The array must have at least 2 entries.
- ▶ **The array must be sorted.** [Click here for detail](#)
- ▶ The array's size must be a power of two.

**Muhammad Moaaz Siddiq – MCS (2nd)**  
**[mc100401285@gmail.com](mailto:mc100401285@gmail.com)**  
**Campus:- Institute of E-Learning & Modern**  
**Studies (IEMS) Samundari**