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Objective Solved
Questions

Volume-8

Data Structures and Algorithms
Digital logic systems
Computer Organization Architecture
Operating Systems



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This book has been organized and executed with a lot of care, dedication and passion for lucidity. A conscious attempt has been made to simplify the concepts to facilitate better understanding of the subject.

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We would feel satisfied if the book meets the needs of the students for whom it is meant.

Lastly, we are thankful to all the engineers, authors whose work has been the source of enlightenment, inspiration and guidance in presenting this book.

It is hoped that the book in its new form will enjoy its ever increasing popularity.

Regards

Dr. Pankaj Goyal



Preface

✍ This book has been written to meet the growing requirements of candidates appearing for Senior Computer Instructor and other competitive Examinations. Though every candidate has ability to succeed but competitive environment, in-depth knowledge, quality guidance, time management and good source of study is required to achieve goals.

This book includes Multiple Choice Questions (MCQ's) which works as a mock exam practice for the reader. Questions of all the subject have been organized in systematic, concepts oriented and error less manner so that it become easy and interesting for even a beginner to understand. It is a very convenient book and must be solved by candidate aiming for competitive exams.

After solving this booklet students can feel encouraged and develop confidence to attempt each and every type of numerical as well as theoretical problems. Each problems explains solving approach so that at the end, so the reader is well equipped to be able to apply any type of problem solving requirement and distinctly choose one strategy or type from the other.

We hope this book will be proved an important tool to succeed in Basic and Senior Computer Instructor and other competitive Examinations.

Even though, enough readings were given for correcting the error and printing mistakes, due to human tendency there could be some minor typos in the book. If any such typos found, they will be highly appreciated and in corporated in the next edition. Also, please provide your valuable suggestions at :engineers.academy.india@gmail.com

Wish you all the best. Have a nice reading.

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Data Structure

OBJECTIVE QUESTION

1. The time complexity of linear search algorithm over an array of n elements is.

- (a) $O(\log_2 n)$ (b) $O(n)$
 (c) $O(n \log_2 n)$ (d) $O(n^2)$

2. The average time required to perform a successful sequential search for an element in an array $A(1 : n)$ is given by.

- (a) $\frac{n+1}{2}$ (b) $\frac{n(n+1)}{2}$
 (c) $\log_2 n$ (d) n^2

3. Which of the following is false?

- (a) A serial search begins with the first array element
 (b) A serial search continues searching, element by element, either until a match is found or until the end of the array is encountered.
 (c) A serial search is useful when the amount of data that must be search is small.
 (d) For a serial search to work, the data in the array must be arranged in either alphabetical or numerical order.

4. To sort many large object or structures, it would be most efficient to

- (a) place reference to them in and array an sort the array
 (b) place them in a linked list and sort the linked list
 (c) place pointers to them in an array and sort the array
 (d) place them in an array and sort the array

5. Which of the following is the correct output for the program given below?

```
#include<stdio.h>
int main()
{
  static int arr[] = {0, 1, 2, 3, 4};
  int *p[] = {arr, arr + 1, arr + 2, arr + 3, arr + 4};
  int **ptr = p;
  ptr++;
  printf ("%d %d %d\n", ptr - p, *ptr - arr, **ptr);
  *ptr++ ;
```

```
ptr - p, *ptr - arr, ** ptr);
  ++ptr;
  printf ("%d %d %d\n", ptr - p, *ptr - arr, ** ptr);
  ++ptr;
  printf ("%d %d %d\n", ptr - p, *ptr - arr, ** ptr);
  return 0;
}
```

- (a) 0 0 0 (b) 1 1 2
 1 1 1 2 2 3
 2 2 2 3 3 4
 3 3 3 4 4 1
 (c) 1 1 1 (d) 0 1 2
 2 2 2 1 2 3
 3 3 3 2 3 4
 3 4 4 3 4 Garbage

6. What will be the output of the following program?

```
#include<stdio.h>
int main()
{
  float a[] = {12.4, 2.3, 4.5, 6.7};
  printf ("%d\n", sizeof (a)/sizeof (a[0]));
  return 0;
}
```

7. Which of these best describes an array?

- (a) A data structure that shows a hierarchical behavior
 (b) Container of objects of similar types
 (c) Container of objects of mixed types
 (d) All of the mentioned

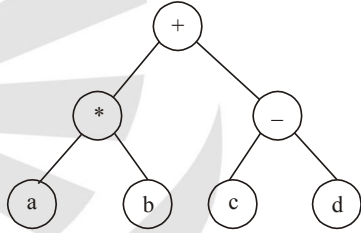
8. How do you initialize an array in C?

- (a) `intarr[3] = (1,2,3);` (b) `intarr(3) = {1,2,3};`
 (c) `intarr[3] = {1,2,3};` (d) `intarr(3) = (1,2,3);`

9. What are the advantages of arrays?

- (a) Easier to store elements of same data type
 (b) Used to implement other data structures like stack and queue
 (c) Convenient way to represent matrices as a 2D array
 (d) All of the mentioned

10. What are the disadvantages of arrays?
- We must know before hand how many elements will be there in the array
 - There are chances of wastage of memory space if elements inserted in an array are lesser than the allocated size
 - Insertion and deletion becomes tedious
 - All of the mentioned
11. Assuming int is of 4 bytes, what is the size of int arr[15]?
- 15
 - 19
 - 11
 - 60
12. What is the time complexity for inserting/deleting at the beginning of the array?
- $O(1)$
 - $O(n)$
 - $O(\log n)$
 - $O(n \log n)$
13. The expression $5 - 2 - 3 * 5 - 2$ will evaluate to 18, if $-$ is left associative and
- $*$ has precedence over $-$
 - $*$ has precedence over $-$
 - $-$ has precedence over $*$
 - $-$ has precedence over $-$
14. Which of the following is a collection of items into which items can be inserted arbitrarily and from which only the smallest item can be removed?
- Descending priority queue
 - Ascending priority queue
 - Fifo queue
 - Lifo queue
15. The five items: A, B, C, D, and E are pushed in a stack, one after the other starting from A. The stack is popped four times and each element is inserted in a queue. Then two elements are deleted from the queue and pushed back on the stack. Now one item is popped from the stack. The popped item is.
- A
 - B
 - C
 - D
16. Using Pop (SI, Item), Push (SI, Item), Read (Item), Print (Item), the variables SI (stack) and Item, and given the input file:
- A, B, C, D, E, F < EOF >
- which stacks are possible:
- 5 A
 - 4 B
 - 3 C
 - 2 D
 - 1 E
- 5 D
 - 3 D
 - 2 A
 - 1 F
- 5
 - 4
 - 3 F
 - 2 D
 - 1 B
- 5
 - 4
 - 3 C
 - 2 E
 - 1 B
17. A postfix expression is merely the reverse of the prefix expression.
- True
 - False
18. What can be said about the array representation of a circular queue when it contains only one element?
- Front = Rear = Null
 - Front = Rear + 1
 - Front = Rear - 1
 - None of these
19. Following sequence of operations is performed on a stack push (1), push (2), pop, push (1), push (2), pop, pop, pop, push (2), Pop. The sequence of popped out values are
- | | |
|---|----|
| 0 | 87 |
| 1 | S1 |
| 2 | |
| 3 | S4 |
| 4 | S2 |
| 5 | |
| 6 | S5 |
| 7 | |
| 8 | S6 |
| 9 | S3 |
- 2, 2, 1, 1, 2
 - 2, 2, 1, 2, 2
 - 2, 1, 2, 2, 1
 - 2, 1, 2, 2, 2
20. In evaluating the arithmetic expression $2 * 3 - (4 + 5)$, using stacks to evaluate its equivalent postfix form, which of the following stack configuration is not possible?
- | |
|---|
| |
| |
| 4 |
| 6 |
 - | |
|---|
| |
| 5 |
| 4 |
| 6 |
 - | |
|---|
| |
| |
| 9 |
| 6 |
 - | |
|---|
| |
| 9 |
| 3 |
| 2 |
21. Stack A has the entries a, b, c (with a on top). Stack B is empty. An entry popped out of stack A can be printed immediately or pushed to stack B. An entry popped out of the stack B can only be printed. In this arrangement, which of the following permutations of a, b, c are not possible?
- b a c
 - b c a
 - c a b
 - a b c
22. Stacks can't be used to
- Evaluate an arithmetic expression in postfix form
 - Implement recursion
 - Convert a given arithmetic expression in infix form to its equivalent postfix form
 - Allocate resources (like CPU) by the operating system.
23. Which one the following permutations can be obtained in the output (in the same order), using a stack assuming that the input is the sequence 1, 2, 3, 4, 5 in that order?
- 3, 4, 5, 1, 2
 - 3, 4, 5, 2, 1
 - 1, 5, 2, 3, 4
 - 5, 4, 3, 2, 1
24. A linear list in which elements can be added or removed at either end but not in the middle is called.
- Queue
 - Dequeue
 - Stack
 - Tree
25. Stack is useful for implementing
- Radix
 - Breadth first search
 - Recursion
 - None of these

26. To insert a node in a circular list at rear position, it should be inserted at ____ of the queue.
 (a) Front position (b) Front - 1 position
 (c) Rear position (d) Rear - 1 position
27. Which of the following data structure may give overflow error, even though the current number of element in it is less than its size?
 (a) Simple queue (b) Circular queue
 (c) Stack (d) None of these
28. The following postfix expression with single digit operands is evaluated using a stack
 $8\ 2\ 3\ \wedge / 2\ 3\ * + 5\ 1\ * -$
 Note that \wedge is the exponentiation operator. The top two elements of the stack after the first $*$ is evaluated are.
 (a) 6, 1 (b) 5, 7 (c) 3, 2 (d) 1, 5
29. When an operand is read, which of the following is done?
 (a) It is placed on to the output
 (b) It is placed in operator stack
 (c) It is ignored
 (d) Operator stack is emptied
30. What should be done when a left parenthesis '(' is encountered?
 (a) It is ignored
 (b) It is placed in the output
 (c) It is placed in the operator stack
 (d) The contents of the operator stack is emptied
31. Which of the following is an infix expression?
 (a) $(a+b)*(c+d)$ (b) $ab+c*$
 (c) $+ab$ (d) $abc+*$
32. What is the postfix expression for the corresponding infix expression?
 $a+b*c+(d*e)$
 (a) $abc*+de*$ (b) $abc*+de*$
 (c) $a+bc*de+*$ (d) $abc*+(de)*$
33. Parentheses are simply ignored in the conversion of infix to postfix expression.
 (a) True (b) False
34. It is easier for a computer to process a postfix expression than an infix expression.
 (a) True (b) False
35. What is the postfix expression for the infix expression?
 $a-b-c$
 (a) $-ab-c$ (b) $abc-$ (c) $-abc$ (d) $-ab-c$
36. What is the postfix expression for the following infix expression?
 a/b^c-d
 (a) $abc^/d-$ (b) ab/cd^- (c) $ab/^cd-$ (d) $abcd^-/d-$
37. Which of the following statement is incorrect with respect to infix to postfix conversion algorithm?
 (a) Operand is always placed in the output
 (b) Operator is placed in the stack when the stack operator has lower precedence
 (c) Parenthesis are included in the output
 (d) Higher and equal priority operators follow the same condition
38. In infix to postfix conversion algorithm, the operators are associated from?
 (a) Right to Left (b) Left to Right
 (c) Centre to Left (d) Centre to Right
39. What is the corresponding postfix expression for the given infix expression?
 $a*(b+c)/d$
 (a) $ab*+cd/$ (b) $ab+*cd/$ (c) $abc*+/d$ (d) $abc+*/d/$
40. What is the corresponding postfix expression for the given infix expression?
 $a+(b*c(d/e^f)*g)*h$
 (a) $ab*cdef/^*g-h+$ (b) $abc*def/^g*-h*+$
 (c) $abcd*^ed/g*-h*+$ (d) $abc*de^fg/*-h*+$
41. What is the correct postfix expression for the following expression?
 $a+b*(c^d-e)^(f+g*h)-i$
 (a) $abc^de-fg+*^*+i-$ (b) $abcde^-fg*+*^h*+i-$
 (c) $abcd^e-fgh*+^*+i-$ (d) $ab^-dc*+ef^gh*+i-$
42. From the given Expression tree, identify the correct postfix expression from the list of options.
- 
- ```

graph TD
 Plus((+)) --- Star((*))
 Plus --- Minus((-))
 Star --- a((a))
 Star --- b((b))
 Minus --- c((c))
 Minus --- d((d))

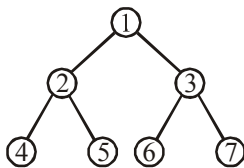
```
- (a)  $ab*cd*+$  (b)  $ab*cd-+$   
 (c)  $abcd-*+$  (d)  $ab*+cd-$
43. A linear collection of data element the linear node is given by mean of pointer is called.  
 (a) Linked list (b) Node list  
 (c) Primitive list (d) None of these
44. The process of accessing data stored in a tape is similar to manipulating data on a  
 (a) Stack (b) Queue (c) List (d) Heap
45. When a new element is inserted in the middle of a linked list, then  
 (a) Only elements that appear after the new element need to be moved  
 (b) Only elements that appear before the new element need to be moved.  
 (c) Elements that appear before and after the new element need to be moved.  
 (d) None of these
46. Which of the following operations is performed more efficiently by doubly linked list than by linear linked list?  
 (a) Deleting a node whose location is given  
 (b) Searching an unsorted list for a given item  
 (c) Inserting a node after the node with a given location  
 (d) Traversing the list to process each node.

47. A linear list in which elements can be added or removed at either end but not in the middle is called.  
 (a) Queue (b) Dequeue (c) Stack (d) Tree
48. Queues serve a major role in  
 (a) Simulation of recursion  
 (b) Simulation of arbitrary linked list  
 (c) Simulation of limited resource allocation  
 (d) Expression evaluation
49. In a circularly linked list organization, insertion of a record involves the modification of  
 (a) No pointer (b) 1 pointer  
 (c) 2 pointers (d) 3 pointers
50. Given two statements:  
 (i) Insertion of an element should be done at the last node in a circular list.  
 (ii) Deletion of an element should be done at the last node of the circular list.  
 (a) Both are True  
 (b) Both are False  
 (c) First is true and second is false  
 (d) First is false and second is true
51. To free which of the following list traversing through the entire list is not necessary?  
 (a) Circular list (b) Singly linked list  
 (c) Double linked list (d) Both (b) and (c)
52. Which of the following statement(s) is/are true regarding insertion of node in a linear linked list?  
 (a) Setting the field of the new node means allocating memory to newly created node  
 (b) If node precedes all others in the list, then insert it at the front and return its address  
 (c) Creating a new node depends upon free memory space  
 (d) All of these
53. Which of the following statements are true about a doubly linked list?  
 (a) It may be either linear or circular  
 (b) It must contain a header node  
 (c) It will occupy same memory space as that of linear linked list, both having same number of nodes  
 (d) All of these
54. Identify the steps to be taken when a first node is to be deleted from linear linked list.  
 I. Set link of start pointer to the second node in the list.  
 II. Free the space associated with first node  
 III. Obtain the address of the second node in the list.  
 IV. Count the number of nodes in the list.  
 (a) I and II (b) I, II and III  
 (c) II and III (d) I, II, III and IV
55. The concatenation of two lists is to be performed in  $O(1)$  time. Which of the following implementations of list should be used?  
 (a) Singly linked list (b) Doubly linked list  
 (c) Circular doubly linked list (d) Array implementation of list
56. In the worst case, the number of comparisons needed to search a singly linked list of length  $n$  for a given element is  
 (a)  $\log_2 n$  (b)  $n/2$   
 (c)  $\log_2 n - 1$  (d)  $n$
57. Given pointer to a node  $X$  in a singly linked list. Only one pointer is given, pointer to head node is not given, can we delete the node  $X$  from given linked list?  
 (a) Possible if  $X$  is not last node  
 (b) Possible if size of linked list is even  
 (c) Possible if size of linked list is odd  
 (d) Possible if  $X$  is not first node
58. What differentiates a circular linked list from a normal linked list?  
 (a) You cannot have the 'next' pointer point to null in a circular linked list  
 (b) It is faster to traverse the circular linked list  
 (c) You may or may not have the 'next' pointer point to null in a circular linked list  
 (d) All of the mentioned
59. What is the time complexity of searching for an element in a circular linked list?  
 (a)  $O(n)$   
 (b)  $O(n \log n)$   
 (c)  $O(1)$   
 (d) None of the mentioned
60. Which of the following application makes use of a circular linked list?  
 (a) Undo operation in a text editor  
 (b) Recursive function calls  
 (c) Allocating CPU to resources  
 (d) All of the mentioned
61. Which of the following is false about a circular linked list?  
 (a) Every node has a successor  
 (b) Time complexity of inserting a new node at the head of the list is  $O(1)$   
 (c) Time complexity for deleting the last node is  $O(n)$   
 (d) None of the mentioned
62. Consider a small circular linked list. How to detect the presence of cycles in this list effectively?  
 (a) Keep one node as head and traverse another temp node till the end to check if its 'next' points to head  
 (b) Have fast and slow pointers with the fast pointer advancing two nodes at a time and slow pointer advancing by one node at a time  
 (c) Cannot determine, you have to pre-define if the list contains cycles  
 (d) None of the mentioned
63. Which of the following sorting algorithms does not have a worst case running time of  $O(n^2)$ ?  
 (a) Insertion sort (b) Merge sort  
 (c) Quick sort (d) Bubble sort

64. For a linear search in an array of  $n$  elements the time complexity for best, worst and average case are..... and .... respectively.
- $O(n)$ ,  $O(1)$ , and  $O(n/2)$
  - $O(1)$ ,  $O(n)$  and  $O(n/2)$
  - $O/1$ ,  $O(n)$  and  $O(n)$
  - $O(1)$ ,  $O(n)$  and  $\left(\frac{n-1}{2}\right)$
65. Using the standard algorithm, what is the time required to determine that a number  $n$  is prime?
- Linear time
  - Logarithmic time
  - Constant time
  - Quadratic time
66. Average successful search time for sequential search on ' $n$ ' items is.
- $\frac{n}{2}$
  - $\frac{(n-1)}{2}$
  - $\frac{(n+1)}{2}$
  - None of these
67. A binary tree in which if all its levels except possibly the last, have the maximum number of nodes and all the nodes at the last level appear as far left as possible, is called
- Full binary tree
  - 2-tree
  - Threaded tree
  - Complete binary tree
68. A list of integers is read in, one at a time, and a binary search tree is constructed. Next the tree is traversed and the integers are printed. Which traversal would result in a printout which duplicates the original order of the list of integers?
- Preorder
  - Postorder
  - Inorder
  - None of these
69. If each node in a tree has value greater than every value in its left subtree and has value less than every value in its right subtree, the tree is called.
- Complete tree
  - Full binary tree
  - Binary search tree
  - Threaded tree
70. Which of the following sorting procedure is the slowest?
- Quick sort
  - Heap sort
  - Shell sort
  - Bubble sort
71. A complete binary tree with the property that the value at each node is at least as large as the values at its children is called.
- Binary search tree
  - AVL tree
  - Completely balanced tree
  - Heap
72. Which of the following best describes sorting?
- Accessing and processing each record exactly once
  - Finding the location of the record with a given key
  - Arranging the data (record) in some given order
  - Adding a new record to the data structure
73. A characteristic of the data that binary search uses but the linear search ignores, is
- Order of the list
  - Length of the list
  - Maximum value in the list
  - Mean of data values
74. A sort which compares adjacent elements in a list and switches where necessary is
- Insertion sort
  - Heap sort
  - Quick sort
  - Bubble sort
75. A sort which iteratively passes through a list to exchange the first element with any element less than it and then repeats with a new first element is called.
- Insertion sort
  - Selection sort
  - Heap sort
  - Quick sort
76. A full binary tree with  $n$  leaves contains
- $n$  nodes
  - $\log_2 n$  nodes
  - $2n - 1$
  - $2^n$  nodes
77. A full binary tree with  $n$  non-leaf nodes contains.
- $\log_2 n$  nodes
  - $n + 1$  nodes
  - $2n$  nodes
  - $2n + 1$  nodes
78. Consider the tree shown in the figure below.
- 
- ```

graph TD
    6((6)) --- 4((4))
    6 --- 12((12))
    4 --- 1((1))
    4 --- 5((5))
    12 --- 10((10))
    12 --- 30((30))
    10 --- 11((11))
  
```
- If this tree is used for sorting, then a new number 8, should be placed as the
- left child of node labelled 30.
 - right child of node labelled 5.
 - right child of node labelled 30.
 - left child of node labelled 10.
79. The number of nodes in a complete binary tree of level 5 is.
- 15
 - 25
 - 63
 - 71
80. A binary tree T has n leaf nodes. The number of nodes of degree 2 in T is.
- $\log_2 n$
 - $2n$
 - n
 - 2^n
81. A complete binary tree of level 5 has how many nodes?
- 15
 - 25
 - 63
 - 33
82. Which of the following statements is used in the binary search algorithm to halve the array?
- middle Sub = (start Sub + stop Sub)/2;
 - middle Sub = start Sub + stop Sub/2;
 - middle Sub = middle Sub/2;
 - middle Sub = (stop Sub - start Sub)/2;

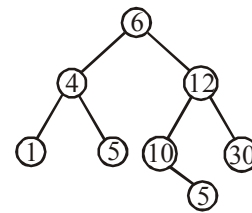
83. The data for which you are searching is called.
 (a) Search argument (b) Sorting argument
 (c) Deletion argument (d) Binary argument
84. The maximum number of nodes of level i of a binary tree is.
 (a) 2^{i-1} (b) 3^{i-1} (c) $i + 1$ (d) 2^{i+2}
85. The maximum number of nodes in a binary tree of depth k is.
 (a) 2^{k-1} (b) 3^{k-2}
 (c) 2^{k-1} (d) $2^k + 2^x + 1$.
86. Which of the following is false?
 (a) A binary search begins with the middle element in the array
 (b) A binary search continues having the array either until a match is found or until there are no more elements to search.
 (c) If the search argument is greater than the value located in the middle of the binary, the binary search continues in the lower half of the array.
 (d) For a binary search to work, the data in the array must be arranged in either alphabetical or numerical order.
87. Traversing a binary tree first root and then left and right subtrees called _____ traversal.
 (a) postorder (b) preorder
 (c) inorder (d) none of these
88. A binary tree having n nodes and depth d will be about complete binary tree if
 (a) any node nd at level less than $d-1$ has two sons
 (b) it contains $2^{d+1} - 1$ nodes
 (c) for any node nd in the tree with a right descendent at level d , nd must have a left son
 (d) all of these
89. Which of the following statements are correct?
 I. If each tree node contains a father field, then it's not necessary to use either stack or threads.
 II. Traversal using father pointers is more time efficient than traversal of a threaded tree.
 III. A in-threaded binary tree is defined as binary tree that is both left-in threaded and right-in threaded.
 (a) II, and III (b) I and III
 (c) All of these (d) None of these
90. The smallest number of key that will force a B-tree of order 3 to have a height 3 is.
 (a) 12 (b) 10
 (c) 7 (d) none of these
91. Consider the following tree:



If the post order traversal gives $ab - cd^* +$ then the label of the nodes 1, 2, 3, will.

- (a) +, -, *, a, b, c, d (b) a, -, b, +, c, *, d
 (c) a, b, c, d, -, *, + (d) -, a, b, +, *, c, d

92. Consider the following tree:

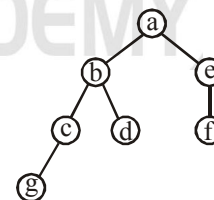


If this tree is used for sorting, then a new number 8 should be placed as the

- (a) left child of node labelled 30.
 (b) right child of node labelled 5.
 (c) right child of node labelled 30.
 (d) left child of node labelled 10.
93. Number of possible ordered trees with 3 nodes A, B, C is.
 (a) 16 (b) 12 (c) 13 (d) 14
94. A binary tree in which every non-leaf node has non-empty left and right subtrees is called a strictly binary tree. Such a tree with 10 leaves.
 (a) Cannot have more than 19 nodes
 (b) Has exactly 19 nodes
 (c) Has exactly 17 nodes
 (d) Cannot have more than 17 nodes
95. Average successful search time taken by binary search on a sorted array of 10 items is.
 (a) 2.6 (b) 2.7 (c) 2.8 (d) 2.9
96. Number of possible binary trees with 3 nodes is
 (a) 12 (b) 13 (c) 14 (d) 15
97. A-2-3 tree is a tree such that
 1. All internal nodes have either 2 or 3 children.
 2. All paths from root to the leaves have the same length.
 The number of internal nodes of a 2-3 tree having 9 leaves could be.
 (a) 4 (b) 5 (c) 6 (d) 7

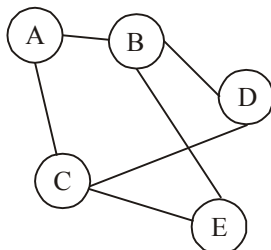
Common Data 98-99

A balanced tree is given below.



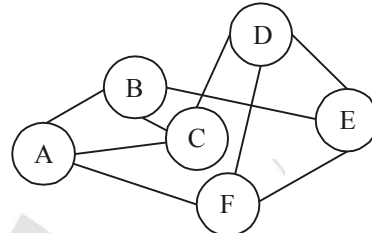
98. A binary tree is generated by inserting in order the following integers:
 50, 15, 62, 5, 20, 58, 91, 3, 8, 37, 60, 24
 The number of nodes in the left subtree of the root respectively is.
 (a) (4, 7) (b) (7, 4) (c) (8, 3) (d) (3, 8)
99. In a max-heap, element with the greatest key is always in the which node?
 (a) Leaf node (b) First node of left sub tree
 (c) root node (d) First node of right sub tree

100. Heap exhibits the property of a binary tree?
 (a) True (b) False
101. What is the complexity of adding an element to the heap.
 (a) $O(\log n)$ (b) $O(h)$
 (c) $O(\log n) \& O(h)$ (d) None of the mentioned
102. The worst case complexity of deleting any arbitrary node value element from heap is
 (a) $O(\log n)$ (b) $O(n)$ (c) $O(n \log n)$ (d) $O(n^2)$
103. Heap can be used as _____
 (a) Priority queue (b) Stack
 (c) A decreasing order array (d) None of the mentioned
104. If we implement heap as min-heap, deleting root node (value 1) from the heap. What would be the value of root node after second iteration if leaf node (value 100) is chosen to replace the root at start.
 (a) 2 (b) 100 (c) 17 (d) 3
105. If we implement heap as maximum heap, adding a new node of value 15 to the left most node of right subtree. What value will be at leaf nodes of the right subtree of the heap.
 (a) 15 and 1 (b) 25 and 1 (c) 3 and 1 (d) 2 and 3
106. An array consist of n elements. We want to create a heap using the elements. The time complexity of building a heap will be in order of
 (a) $O(n \cdot n \cdot \log n)$ (b) $O(n \cdot \log n)$
 (c) $O(n \cdot n)$ (d) $O(n \cdot \log n \cdot \log n)$
107. What is the space complexity of searching in a heap?
 (a) $O(\log n)$ (b) $O(n)$ (c) $O(1)$ (d) $O(n \log n)$
108. Given an array of element 5,7,9,1,3,10,8,4. Tick all the correct sequences of elements after inserting all the elements in a min-heap.
 (a) 1,3,4,7,8,9,10 (b) 1,4,3,8,9,5,7,10
 (c) 1,3,4,5,8,7,9,10 (d) None of the mentioned
109. Which of the following statements for a simple graph is correct?
 (a) Every path is a trail
 (b) Every trail is a path
 (c) Every trail is a path as well as every path is a trail
 (d) None of the mentioned
110. For the given graph(G), which of the following statements is true?



- (a) G is a complete graph
 (b) G is not a connected graph
 (c) The vertex connectivity of the graph is 2
 (d) The edge connectivity of the graph is 1

111. What is the number of edges present in a complete graph having n vertices?
 (a) $(n \cdot (n+1))/2$
 (b) $(n \cdot (n-1))/2$
 (c) n
 (d) Information given is insufficient
112. In a simple graph, the number of edges is equal to twice the sum of the degrees of the vertices.

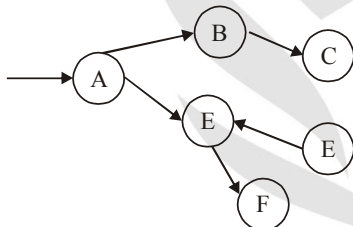


- (a) True (b) False
113. Which of the following properties does a simple graph not hold?
 (a) Must be connected
 (b) Must be unweighted
 (c) Must have no loops or multiple edges
 (d) All of the mentioned
114. What is the maximum number of edges in a bipartite graph having 10 vertices?
 (a) 24 (b) 21 (c) 25 (d) 16
115. Which of the following is true?
 (a) A graph may contain no edges and many vertices
 (b) A graph may contain many edges and no vertices
 (c) A graph may contain no edges and no vertices
 (d) None of the mentioned
116. For a given graph G having v vertices and e edges which is connected and has no cycles, which of the following statements is true?
 (a) $v=e$ (b) $v = e+1$
 (c) $v + 1 = e$ (d) None of the mentioned
117. For which of the following combinations of the degrees of vertices would the connected graph be eulerian?
 (a) 1,2,3 (b) 2,3,4 (c) 2,4,5 (d) 1,3,5
118. A graph with all vertices having equal degree is known as a _____
 (a) Multi Graph (b) Regular Graph
 (c) Simple Graph (d) Complete Graph
119. Which of the following ways can be used to represent a graph?
 (a) Adjacency List and Adjacency Matrix
 (b) Incidence Matrix
 (c) Adjacency List, Adjacency Matrix as well as Incidence Matrix
 (d) None of the mentioned
120. The number of elements in the adjacency matrix of a graph having 7 vertices is _____
 (a) 7 (b) 14 (c) 36 (d) 49

121. Adjacency matrix of all graphs are symmetric.
 (a) False (b) True
122. For the adjacency matrix of a directed graph the row sum is the _____ degree and the column sum is the _____ degree.
 (a) in, out (b) out, in
 (c) in, total (d) total, out
123. On which of the following statements does the time complexity of checking if an edge exists between two particular vertices is not, depends?
 (a) Depends on the number of edges
 (b) Depends on the number of vertices
 (c) Is independent of both the number of edges and vertices
 (d) It depends on both the number of edges and vertices
124. Which of these adjacency matrices represents a simple graph?
 (a) [[1, 0, 0], [0, 1, 0], [0, 1, 1]]
 (b) [[1, 1, 1], [1, 1, 1], [1, 1, 1]]
 (c) [[0, 0, 1], [0, 0, 0], [0, 0, 1]]
 (d) [[0, 0, 1], [1, 0, 1], [1, 0, 0]]
125. Given an adjacency matrix $A = [[0, 1, 1], [1, 0, 1], [1, 1, 0]]$, how many ways are there in which a vertex can walk to itself using 2 edges.
 (a) 2 (b) 4 (c) 6 (d) 8

126. Every Directed Acyclic Graph has at least one sink vertex.
 (a) True (b) False

127. What sequence would the BFS traversal of the given graph yield?



- (a) A F D B C E (b) C B A F D
 (c) A B D C F (d) F D C B A
128. For any two different vertices u and v of an Acyclic Directed Graph if v is reachable from u , u is also reachable from v ?
 (a) True (b) False
129. What is the value of the sum of the minimum in-degree and maximum out-degree of an Directed Acyclic Graph?
 (a) Depends on a Graph
 (b) Will always be zero
 (c) Will always be greater than zero
 (d) May be zero or greater than zero
130. In which of the following case(s) is it possible to obtain different results for call-by-reference and call-by-name parameter passing?
 (a) Passing an expression as a parameter
 (b) Passing an array as a parameter
 (c) Passing a pointer as a parameter
 (d) Passing an array element as a parameter

131. Match the pairs in the following:

List-I

- A. Pointer data type
 B. Activation record
 C. Repeat-until
 D. Coercion

List-II

- P. Type conversion
 Q. Dynamic data structure
 R. Recursion
 S. Nondeterministic loop

132. Indicate all the true statements from the following:

- (a) A programming language not supporting either recursion or pointer type does not need the support of dynamic memory allocation.
 (b) Although C does not support call by name parameter passing, the effect can be correctly simulated in C.

133. What does the following code do?

```

var a, b : integer;
begin
  a:=a+b;
  b:=a-b;
  a:=a-b
end;

```

end;

- (a) exchanges (a) and (b)
 (b) doubles (a) and stores in (b)
 (c) doubles (b) and stores in (a)
 (d) leaves (a) and (b) unchanged

134. In which one of the following cases is it possible to obtain different results for call-by reference and call-by-name parameter passing methods?

- (a) Passing a constant value as a parameter
 (b) Passing the address of an array as a parameter
 (c) Passing an array element as a parameter
 (d) Passing an array

135. Consider the following C function definition

```

int Trial(int a, int b, int c)
{
  if ((a >= b) && (c < b)) return b;
  else if (a >= b) return Trial (a,c,b);
  else return Trial(b,a,c);
}

```

The function Trial

- (a) Finds the maximum of a, b and c
 (b) Finds the minimum of a, b and c
 (c) Finds the middle number of a, b and c
 (d) None of the above

136. The following C declarations

```

struct node{
  int i;
  float j;
};
struct node *s[10];
define s to be

```

- (a) An array, each element of which is a pointer to a structure of type node
- (b) A structure of 2 fields, each field being a pointer to an array of 10 elements
- (c) A structure of 3 fields: an integer, a float, and an array of 10 elements
- (d) An array, each element of which is a structure of type node

137. The value of j at the end of the execution of the following C program is _____

```
int incr(int i) {
    static int count = 0;
    count = count + i;
    return (count);
}
main() {
    int i, j;
    for(i=0; i<=4; i++)
        j = incr(i);
}
```

- (a) 10 (b) 4 (c) 6 (d) 7

139. Consider the following C function

```
int f(int n)
{
    static int i = 1;
    if(n >= 5) return n ;
    n = n + i ;
    i++;
    return f(n);
}
```

The value returned by f(1) is

- (a) 5 (b) 6 (c) 7 (d) 8

140. Consider the following C-program

```
void foo(int n, int sum) {
    int k = 0, j = 0;
    if (n == 0) return;
    k = n%10;
    j = n/10;
    sum = sum + k;
    foo (j, sum);
    printf ("%d", k);
}
int main() {
    int a = 2048, sum = 0;
    foo (a, sum);
    printf("%d\n", sum);
}
```

What does the above program print?

- (a) 8, 4, 0, 2, 14 (b) 8, 4, 0, 2, 0
(c) 2, 0, 4, 8, 14 (d) 2, 0, 4, 8, 0

141. What is the output printed by the following program?

```
#include<stdio.h>
int f(int n, int k)
{
    if(n == 0) return 0;
    else if(n%2) return f(n/2, 2*k)+k;
    else return f(n/2, 2*k) - k;
}
int main()
{
    printf("%d", f(20, 1));
    return 0;
}
```

- (a) 5 (b) 8 (c) 9 (d) 20

142. What will be the output of the following C program segment?

```
char inChar = 'A';
switch(inChar)
{
    case 'A': printf ("Choice A\ n");
    case 'B':
    case 'C': printf ("Choice B");
    case 'D':
    case 'E':
    default: printf("NO Choice");}

```

- (a) No Choice
(b) Choice A
(c) Choice A, Choice B No Choice
(d) Program gives no output as it is erroneous

143. Consider the following C program.

```
#include<stdio.h>
int main() {
    static int a[] = {10, 20, 30, 40, 50};
    static int *p[] = {a, a+3, a+4, a+1, a+2};
    int **ptr = p; ptr++;
    printf ("%d%d", prt-p, **ptr);
}
```

The output of the program is _____.

144. The value printed by the following program is _____.

```
void f(int*p, int m)
{
    m = m + 5;
    *p = *p + m;
    return;
}
void main()
```

```
{
    int i = 5, j = 10;
    f(&i, j);
    printf("%d", i+j);
}
```

145. Consider the following two functions.

```
void fun1(int n)
{
    if(n==0) return;
    printf("%d", n);
    fun2(n - 2);
    printf("%d", n);
}

void fun2(int n)
{
    if(n==0) return;
    printf("%d", n);
    fun1(++n);
    printf("%d", n);
}
```

The output printed when fun1 (5) is called is

- (a) 53423122233445 (b) 53423120112233
(c) 53423122132435 (d) 53423120213243

146. Consider the following C program:

```
#include<stdio.h>
int main()
{
    int arr[] = {1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 1, 2, 5}; *ip = arr + 4;
    printf("%d\n", ip[1]);
    return 0;
}
```

The number that will be displayed on execution of the program is _____.

147. Consider the following C program:

```
#include<stdio.h>
int main()
{
    int a[] = {2, 4, 6, 8, 10};
    int i, sum = 0, *b = a+4;
    for(i=0; i<5; i++)
        sum = sum + (*b-i) - *(b-i);
    printf("%d\n", sum);
    return 0;
}
```

The output of the above C program is _____.

148. A mathematical-model with a collection of operations defined on that model is called

- (a) Data Structure (b) Abstract Data Type
(c) Primitive Data Type (d) Algorithm

149. Representation of data structure in memory is known as:

- (a) Recursive (b) Abstract data type
(c) Storage structure (d) File structure

150. An ADT is defined to be a mathematical model of a user-defined type along with the collection of all _____ operations on that model.

- (a) Cardinality (b) Assignment
(c) Primitive (d) Structured

151. Theoretical computer science refers to the collection of such topics that focus on the _____, as well as mathematical aspects of computing.

- (a) Abstract (b) Logical
(c) Both (a) and (b) (d) None of the above

152. Data type is the classification of pieces of information in a _____.

- (a) Linker (b) Code
(c) Program (d) None of the above

153. A dynamic data structure is one in which the memory for elements is allocated dynamically at runtime. Is this statement True or False?

- (a) True (b) False
(c) May be
(d) Partially true and partially false

154. Maintaining an efficient communication between programmers is job done by

- (a) Programmers itself (b) Integration team
(c) Communication team (d) Design patterns

155. Consider an implementation of unsorted singly linked list. Suppose it has its representation with a head pointer only.

Given the representation, which of the following operation can be implemented in O(1) time?

- (i) Insertion at the front of the linked list
(ii) Insertion at the end of the linked list
(iii) Deletion of the front node of the linked list
(iv) Deletion of the last node of the linked list
(a) I and II (b) I and III
(c) I, II and III (d) I, II and IV

156. The process of accessing data stored in a serial access memory is similar to manipulating data on a _____

- (a) Heap (b) Binary Tree
(c) Array (d) Stack