



COA 306

B.A./B.Sc VIth SEMESTER EXAMINATION, 2023-24

COMPUTER APPLICATION

(Algorithms and Data Structures)

(CBCS MODE)

AFFIX PRESCRIBED
RUBBER STAMP

Paper ID

(To be filled in the
OMR Sheet)

Date (तिथि) : _____

5556

अनुक्रमांक (अंकों में) :

Roll No. (In Figures) :

अनुक्रमांक (शब्दों में) :

Roll No. (In Words) :

Time : 1:30 Hrs.

समय : 1:30 घण्टे

Max. Marks : 75

अधिकतम अंक : 75

नोट : पुस्तिका में 50 प्रश्न दिये गये हैं, सभी प्रश्न करने होंगे। प्रत्येक प्रश्न 1.5 अंक का होगा।

Important Instructions :

1. The candidate will write his/her Roll Number only at the places provided for, i.e. on the cover page and on the OMR answer sheet at the end and nowhere else.
2. Immediately on receipt of the question booklet, the candidate should check up the booklet and ensure that it contains all the pages and that no question is missing. If the candidate finds any discrepancy in the question booklet, he/she should report the invigilator within 10 minutes of the issue of this booklet and a fresh question booklet without any discrepancy be obtained.

महत्वपूर्ण निर्देश :

1. अभ्यर्थी अपने अनुक्रमांक केवल उन्हीं स्थानों पर लिखेंगे जो इसके लिए दिये गये हैं, अर्थात् प्रश्न पुस्तिका के मुख्य पृष्ठ तथा साथ दिये गये ओ०एम०आर० उत्तर पत्र पर, तथा अन्यत्र कहीं नहीं लिखेंगे।
2. प्रश्न पुस्तिका मिलते ही अभ्यर्थी को जाँच करके सुनिश्चित कर लेना चाहिए कि इस पुस्तिका में पूरे पृष्ठ हैं और कोई प्रश्न छूटा तो नहीं है। यदि कोई विसंगति है तो प्रश्न पुस्तिका मिलने के 10 मिनट के भीतर ही कक्ष परिप्रेक्षक को सूचित करना चाहिए और बिना त्रुटि की दूसरी प्रश्न पुस्तिका प्राप्त कर लेना चाहिए।

1. Minimum number of fields in each node of a doubly linked list are :
 - (A) 2
 - (B) 3
 - (C) 4
 - (D) 5
2. Which of the following data structures is required to convert arithmetic expression in infix to its equivalent postfix notation ?
 - (A) Queue
 - (B) Linked list
 - (C) Binary search tree
 - (D) None of these
3. The number of edges in a complete graph of n Vertices is :
 - (A) $n(n + 1)/2$
 - (B) $n(n - 1)/2$
 - (C) $n^2/2$
 - (D) n
4. The time complexity of quicksort is :
 - (A) $o(n)$
 - (B) $o(\log n)$
 - (C) $o(n^2)$
 - (D) $o(n \log n)$
5. Quick sort is also known as :
 - (A) Merge Sort
 - (B) Tree Sort
 - (C) Shell Sort
 - (D) Partition and exchange Sort

6. The total number of Comparisions in a bubble sort is :
- (A) $O(n \log n)$
 - (B) $O(2n)$
 - (C) $O(n^2)$
 - (D) $O(n)$
7. Which of the following is an application of stack ?
- (A) Finding factorial
 - (B) Tower of Hanoi
 - (C) Infix to Postfix
 - (D) All of the above
8. The operation of processing each element in the list is called as :
- (A) Sorting
 - (B) Merging
 - (C) Inserting
 - (D) Traversal
9. Which of the following data structures cannot store the non-homogeneous data elements ?
- (A) Arrays
 - (B) Records
 - (C) Pointers
 - (D) Stacks
10. Which of the following is non-linear data structures ?
- (A) Stacks
 - (B) List
 - (C) Strings
 - (D) Trees

11. The two key measures to find the efficiency of an algorithm are :
- (A) Time and space
 - (B) Capacity and complexity
 - (C) Data and space
 - (D) Processor and memory
12. You have to sort a list L consisting of a sorted list followed by a few 'random' elements. which of the following sorting methods would be especially suitable for such a task ?
- (A) Bubble sort
 - (B) Selection sort
 - (C) Quick sort
 - (D) Insertion sort
13. If $(\text{rear} = \text{maxsize}-1) \text{ rear} = 0$; else $\text{rear} = \text{rear} + 1$; is required in:
- (A) Circular queue
 - (B) Stack
 - (C) Linear queue
 - (D) Linked list
14. The maximum degree of an Vertex in a simple graph with n vertices is :
- (A) $n + 1$
 - (B) $n - 1$
 - (C) $2n - 1$
 - (D) n
15. The data structure required to check whether expression contains balanced parenthesis is :
- (A) Queue
 - (B) Array
 - (C) Tree
 - (D) Stack

16. A graph is a tree, if and only if it :
- (A) Is completely connected
 - (B) In minimally connected
 - (C) Contains a circuit
 - (D) Is planner
17. A graph in which all nodes are of equal degree is called :
- (A) Multi graph
 - (B) Non-regular graph
 - (C) Regular graph
 - (D) Complete graph
18. In which case, the elements must be in sorted order :
- (A) Linear search
 - (B) Quick sort
 - (C) Binary search
 - (D) Selection search
19. Which of the following require extra memory for storage ?
- (A) Linked list
 - (B) Array
 - (C) Both (A) and (B)
 - (D) None of the above
20. Which data structure is used to implement a recursive function call ?
- (A) Linked list
 - (B) Binary search
 - (C) Stack
 - (D) Queue

21. If the size of the stack is 10 and we try to add the 11th element in the stack, then condition is called as
- (A) Underflow
 - (B) Garbage collection
 - (C) Overflow
 - (D) Not to be say
22. If the element '1', '2', '3' and '4' are added in the stack, so what would be the order for the removal ?
- (A) 1234
 - (B) 2134
 - (C) 4321
 - (D) 3214
23. The **minimum** number of stacks required to implement a stack is :
- (A) 1
 - (B) 2
 - (C) 3
 - (D) 5
24. Consider the following stack implemented using stack.
- ```
#define SIZE 11
Struct STACK
{
 int arr[SIZE] ;
 int top = -1 ;
}
```
- What would be the maximum value of the top that does not cause the overflow of the Stalk ?
- (A) 8
  - (B) 9
  - (C) 11
  - (D) 10

25. Merge sort uses :
- (A) Divide-and-conquer
  - (B) Backtracking
  - (C) Heuristic approach
  - (D) Greedy approach
26. What is a data structure ?
- (A) A programming language
  - (B) A collection of algorithms
  - (C) A way to store and organize data
  - (D) A type of computer hardware
27. From the following sorting algorithms which has the lowest worst case complexity ?
- (A) Bubble sort
  - (B) Quick sort
  - (C) Merge sort
  - (D) Selection sort
28. Which of the following sorting procedure is the slowest ?
- (A) Quick sort
  - (B) Heap sort
  - (C) Shell sort
  - (D) Bubble sort
29. Which of the following properties are necessary for an algorithm ?
- (A) Definiteness
  - (B) Correctness
  - (C) Effectiveness
  - (D) (A) and (C)

30. The time required to search an element in a linked list of length  $n$  is :
- (A)  $O(\log n)$
  - (B)  $O(n)$
  - (C)  $O(1)$
  - (D)  $O(n^2)$
31. For a binary search algorithm to work, it is necessary that the array (list) must be :
- (A) Sorted
  - (B) Unsorted
  - (C) In a heap
  - (D) Popped out of stack
32. What data structure is used for breadth first traversal of a graph ?
- (A) Queue
  - (B) Stack
  - (C) list
  - (D) tree
33. In doubly linked lists :
- (A) A pointer is maintained to store both next and previous nodes
  - (B) Two pointers are maintained to store next and previous nodes
  - (C) A pointer to Self is maintained for each node
  - (D) None of these
34. The worst case complexity of binary search matches with :
- (A) Interpolation search
  - (B) Linear search
  - (C) Merge sort
  - (D) Heap sort

35. To represent hierarchical relationship between elements, which data structure is suitable?
- (A) Deque
  - (B) Priority
  - (C) Tree
  - (D) All of the above
36. The depth of a complete binary tree is given by :
- (A)  $D_n = n \log_2 n$
  - (B)  $D_n = n \log_2 n + 1$
  - (C)  $D_n = \log_n 2$
  - (D)  $D_n = \log_2 n + 1$
37. Which of the following sorting algorithms is of divide-and-conquer type ?
- (A) Bubble sort
  - (B) Insertion sort
  - (C) Quick sort
  - (D) All of above
38. In a graph if  $e=[u,v]$ , the  $u$  and  $v$  are called :
- (A) Endpoints of  $e$
  - (B) Adjacent nodes
  - (C) Neighbors
  - (D) All of the above
39. The time factor when determining the efficiency of algorithm is measured by :
- (A) Counting microseconds
  - (B) Counting the number of key operations
  - (C) Counting the number of statements
  - (D) Counting the kilobytes of algorithm

40. The Complexity of Bubble sort algorithm is :
- (A)  $O(n)$
  - (B)  $O(\log n)$
  - (C)  $O(n^2)$
  - (D)  $O(n \log n)$
41. In a stack the command to access  $n^{\text{th}}$  element from the top of the stacks will be :
- (A)  $S[\text{TOP}-n]$
  - (B)  $S[\text{TOP}+n]$
  - (C)  $S[\text{TOP}-n-1]$
  - (D) None of the above
42. In a balance binary tree the height of two sub-trees of every node can not differ by more than :
- (A) 1
  - (B) 2
  - (C) 3
  - (D) 4
43. Which data structure is used for implementing recursion ?
- (A) Stack
  - (B) Queue
  - (C) List
  - (D) Array
44. Recursive algorithms are based on :
- (A) Divide and conquer approach
  - (B) Top-down approach
  - (C) Bottom-up approach
  - (D) Heuristic approach

45. Worst case efficiency of binary search is :
- (A)  $\log 2n + 1$
  - (B)  $n$
  - (C)  $2n$
  - (D)  $\log n$
46. For analyzing an algorithm, which is better computing time ?
- (A)  $O(100 \log N)$
  - (B)  $O(N)$
  - (C)  $O(N \log N)$
  - (D)  $O(N^2)$
47. Which of the following algorithm scans the list by swapping the entries whenever pair of adjacent keys are out of desired order ?
- (A) Insertion sort
  - (B) Quick sort
  - (C) Shell sort
  - (D) Bubble sort
48. Worst case efficiency of which search is  $O(n)$  ?
- (A) Sequential search
  - (B) Binary search
  - (C) Indexed search
  - (D) Hashing
49. The amount of memory needs to run to completion is :
- (A) Space complexity
  - (B) Worst case
  - (C) Time complexity
  - (D) Best case

50. Worst case time complexity of quick sort is :

- (A)  $O(n)$
- (B)  $O(n \log n)$
- (C)  $O(n^2)$
- (D)  $O(\log n)$

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