**Multiple choice questions section ‘A’ 30×1=30**

1. A mathematical-model with a collection of operations defined on that model is called
   1. Data Structure
   2. **Abstract Data Type**
   3. Primitive Data Type
   4. Algorithm
2. Which of the following sorting algorithms can be used to sort a random linked list with minimum time complexity?
   1. Insertion Sort
   2. Quick Sort
   3. Heap Sort
   4. **Merge Sort**
3. Which of these best describes an array?
   1. A data structure that shows a hierarchical behavior
   2. **Container of objects of similar types**
   3. Container of objects of mixed types
   4. All of the mentioned
4. Which out of these is a non-linear data-structure:
   1. arrays
   2. queues
   3. linked-lists
   4. **tree**
5. The no of external nodes in a full binary tree with n internal nodes is?
   1. n
   2. **n+1**
   3. **2n**
   4. 2n + 1
6. The Disadvantage of using array representation for binary trees is?
   1. difficulty in knowing children nodes of a node
   2. difficult in finding the parent of a node
   3. **have to know the maximum number of nodes possible before creation of trees**
   4. difficult to implement
7. Which of the following problems can be solved using recursion?
   1. Factorial of a number
   2. Nth fibonacci number
   3. Length of a string
   4. **All of above**
8. Process of deleting an element in stack is called \_\_\_\_\_\_\_\_\_\_\_\_
   1. Create
   2. Push
   3. **Pop**
   4. Evaluation
9. Insertion in a linked list can be done from:
   1. beginning
   2. End
   3. middle
   4. **All of the above**
10. What In recursion, the condition for which the function will stop calling itself is \_\_\_\_\_\_\_\_\_\_\_\_ .
    1. Best case
    2. Worst case
    3. **Base case**
    4. None of above
11. Postfix notation is also known as:
    1. polish notation
    2. **reverse polish notation**
    3. post notation
    4. post-operator notation
12. What is the value of the postfix expression 2 3 2 4 + – \*:
    1. Something between -5 and -15
    2. **Something between 5 and 10**
    3. Something between 5 and 15
    4. Something between 15 and 100
13. All leaf nodes of a tree are termed as:
    1. **terminal nodes**
    2. non-terminal nodes
    3. child nodes
    4. internal nodes
14. The root node is
    1. terminal node
    2. internal nodes
    3. child node
    4. **none of the above**
15. The postfix form of A\*B+C/D is?
    1. \*AB/CD+
    2. **AB\*CD/+**
    3. A\*BC+/D
    4. ABCD+/\*
16. Which of the following points is/are true about Linked List data structure when it is compared with array?
    1. Arrays have better cache locality that can make them better in terms of performance.
    2. It is easy to insert and delete elements in Linked List
    3. Random access is not allowed in a typical implementation of Linked Lists
    4. **All of the above**
17. Which of the following statement about binary tree is CORRECT?
    1. Every binary tree is either complete or full
    2. Every complete binary tree is also a full binary tree
    3. **Every full binary tree is also a complete binary tree**
    4. A binary tree cannot be both complete and full
18. Which type of traversal of binary search tree outputs the value in sorted order?
    1. Pre-order
    2. **In-order**
    3. Post-order
    4. None
19. The number of edges from the root to the node is called \_\_\_\_\_\_\_\_\_\_ of the tree.
    1. Height
    2. **Depth**
    3. Length
    4. None of above
20. A connected planar graph having 6 vertices, 7 edges contains \_\_\_\_\_\_\_\_\_\_\_\_\_ regions.
    1. 15
    2. 1
    3. **3**
    4. 11
21. 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?
    1. **v = e+1**
    2. v=e
    3. v + 1 = e
    4. None of above
22. In linked list each node contain minimum of two fields. One field is data field to store the data second field is?
    1. Pointer to character
    2. Pointer to integer
    3. **Pointer to node**
    4. Node
23. A graph with all vertices having equal degree is known as a \_\_\_\_\_\_\_\_\_\_ .
    1. Multi Graph
    2. **Regular Graph**
    3. Simple Graph
    4. Complete Graph
24. What is the worst case complexity of bubble sort?
    1. O(nlogn)
    2. O(logn)
    3. O(n)
    4. **O(n2)**
25. Which of the following is not true about QuickSort?
    1. in-place algorithm
    2. adaptive sorting algorithm
    3. can be implemented as a stable sort
    4. **pivot position can be changed**
26. The Data structure used in standard implementation of Breadth First Search is?
    1. **Stack**
    2. Queue
    3. Linked List
    4. None of above
27. In in order traversal of a binary tree, the root node is visited:
    1. after the traversal of right and left subtrees
    2. before the traversal of right & left subtrees
    3. **in-between the traversal of left and right subtrees**
    4. none of these
28. The complexity of linear search algorithm is:
    1. **O(n)**
    2. O(log n)
    3. O(n2)
    4. O(n log n)
29. The given expression AB+ is in the form of
    1. infix
    2. **postfix**
    3. prefix
    4. none
30. Links between the pair vertices in the graph is called as :
    1. Line
    2. **Edge**
    3. Corner
    4. node
31. **When new data are to be inserted into a data structure, but there is no available space; this situation is usually called**
    1. underflow
    2. **overflow**
    3. house full
    4. saturated
32. A graph is collection of node, called………and line segments called……
    1. **Vertices, edges**
    2. Edges, vertices
    3. Vertices, path
    4. None of above
33. Any node in path from root to node is called
    1. Successor node
    2. Ancestor node
    3. **Internal node**
    4. None of above
34. The combination of \_\_\_\_\_\_\_\_\_ and algorithm is considered as program.
    1. Flowchart
    2. Pseudo code
    3. **Data structure**
    4. All of above
35. The efficiency of algorithm is measured in\_\_\_\_\_ .
    1. Time complexity
    2. Space complexity
    3. **Both of above**
    4. None of above
36. Which of these best describes an array?
    1. A data structure that shows a hierarchical behavior
    2. **Container of objects of similar types**
    3. Container of objects of mixed types
    4. All of the mentioned
37. Process of inserting an element in stack is called \_\_\_\_\_\_\_\_\_\_\_\_
    1. Create
    2. **Push**
    3. Evaluation
    4. Pop
38. In a stack, if a user tries to remove an element from empty stack it is called \_\_\_\_\_\_\_\_\_
    1. **Underflow**
    2. Empty collection
    3. Overflow
    4. Garbage Collection
39. What is the value of the postfix expression 6 3 2 4 + – \*:
    1. 10
    2. 15
    3. 18
    4. **20**
40. The postfix form of A\*B+C/D is?
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    2. **AB\*CD/+**
    3. A\*BC+/D
    4. ABCD+/\*
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45. The Disadvantage of using array representation for binary trees is?
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    3. **have to know the maximum number of nodes possible before creation of trees**
    4. difficult to implement
46. A queue is \_\_\_\_\_\_\_\_\_ ?
    1. **FIFO (First In First Out) list**
    2. LIFO (Last In First Out) list
    3. Ordered array
    4. Linear tree
47. A normal queue, if implemented using an array of size MAX\_SIZE, gets full when
    1. Front = (rear + 1)mod MAX\_SIZE
    2. **Rear = MAX\_SIZE – 1**
    3. Front = rear + 1
    4. Rear = front
48. The elements of an array are stored successively in memory cells because
    1. **by this way computer can keep track only the address of the first element and the addresses of other elements can be calculated**
    2. the architecture of computer memory does not allow arrays to store other than serially
    3. both of above
    4. none of above
49. A linear collection of data elements where the linear node is given by means of pointer is called?
    1. **Linked list**
    2. Node list
    3. Primitive list
    4. None of the mentioned
50. What would be the asymptotic time complexity to find an element in the linked list?
    1. O(1)
    2. **O(n)**
    3. O(n2)
    4. None of above
51. Which of the following c code is used to create new node?
    1. **ptr = (NODE\*)malloc(sizeof(NODE));**
    2. ptr = (NODE\*)malloc(NODE);
    3. ptr = (NODE\*)malloc(sizeof(NODE\*));
    4. ptr = (NODE)malloc(sizeof(NODE));
52. What is the time complexity to count the number of elements in the linked list?
    1. O(1)
    2. **O(n)**
    3. O(logn)
    4. None of above
53. In linked list implementation of a queue, where does a new element be inserted?
    1. At the head of link list
    2. At the center position in the link list
    3. **At the tail of the link list**
    4. None of the mentioned
54. Which among the following are applications of queues?
    1. **Queues keep track of events waiting to be handled, like multiple button clicks**
    2. Queues are used for evaluation of arithmetic expressions
    3. Queues are used in parsing
    4. None of these
55. The complexity of linear search algorithm is:
    1. **O(n)**
    2. O(log n)
    3. O(n2)
    4. O(n log n)
56. The given expression AB+ is in the form of
    1. infix
    2. **postfix**
    3. prefix
    4. none
57. Links between the pair vertices in the graph is called as :
    1. Line
    2. **Edge**
    3. Corner
    4. node
58. **Finding the location of the element with a given value is:**
    1. Traversal
    2. **Search**
    3. Sort
    4. None of above
59. **The operation of processing each element in the list is known as**
    1. Sorting
    2. Merging
    3. Inserting
    4. **Traversal**
60. **Which of the following case does not exist in complexity theory**
    1. Best case
    2. Worst case
    3. Average case
    4. **Null case**

**Short answer Questions(*Any six*) section ‘B’ 6×5=30**

1. ‘To write an efficient program, we should know about data structures.’ Explain the above statement.(unit 1:introduction to DSA)
2. Write recursive algorithm and evaluate to get Factorial of given numbers. (Unit 7: Recursion)
3. Explain Push and pop operation with algorithm.(Unit 4 : stack)
4. Define queue as ADT.(Unit 5: queue)
5. Explain different types of binary tree.(unit 8 : binary search tree)
6. Explain the operations of graph.(unit 9 : graph)
7. Differentiate between bubble and quick sort with suitable example. (unit 10: sorting)
8. Explain the advantages of linked list over contagious link with real time example in terms of complexity. (unit 2: linked list)
9. What are the major characteristics of algorithm? (unit 1 : introduction to DSA)
10. Define queue as ADT. (unit 5: queue)
11. Explain Tower of Honoi algorithm. (unit 7: Recursion)
12. Define data structure with example. What is abstract data type(ADT). (unit 1: introduction to DSA)
13. Differentiate between singly, doubly circular linked list. (unit 2: linked list)
14. Explain merge sort with example.(unit 9: sorting)
15. Explain the operation of stack with example.(unit 4: stack)
16. Explain binary search tree as ADT.(unit 8: Binary search tree)

**Long answer Questions Section ‘c’ 2×20= 40**

1. Trace the following infix to postfix expression. (unit 6:postponement)

A$B\*C-D+E/F(G+H)

Evaluate the postfix expression acquired from above for the given values:

A=6, B= 2 , C=5 ,D=1 ,E= 4, F=4 , G= 2 ,H = 3

1. Why recursion is required? Explain with Tower-Of-Hanoi example. How Recursive algorithm makes program effective? Write the merits and demerits of recursion in programming. How you represent binary search tree in linked list?(unit 7 & unit 8)
2. Explain in order, post order and preorder with suitable example. List the application of stack. Why linked list is suitable for programming while implementing other data structures such as queue, Stack etc. ?(unit 2,unit 4 & unit 8)
3. How can you convert from infix to postfix notation? Write the precedence rule for infix to postfix expression. Trace the following expression into postfix expression.(unit 5 : postponement)

(A+B\*C)+D-E/F

1. What is graph traversal? Write BFS and DFS algorithm and trace the algorithms with example. Briefly explain difference between selection and insertion sort.(unit 8 &9)
2. What do you mean by recursion? Explain the implementation of Fibonacci number by recursion with suitable examples. Explain the algorithm of inserting element on linked list at any given position and beginning of the list.(unit 2 &6)