Data structures MCQ

Unit I

1. Which of these best describes an array?
   a) A data structure that shows a hierarchical behaviour
   b) Container of objects of similar types
   c) Arrays are immutable once initialized
   d) Array is not a data structure
2. What are the advantages of arrays?
   a) Objects of mixed data types can be stored
   b) Elements in an array cannot be sorted
   c) Index of first element of an array is 1
   d) Easier to store elements of same data type
3. What are the disadvantages of arrays?
   a) Data structure like queue or stack cannot be implemented
   b) There are chances of wastage of memory space if elements inserted in an array are lesser than the allocated size
   c) Index value of an array can be negative
   d) Elements are sequentially accessed
4. Assuming int is of 4bytes, what is the size of int arr[15];?
   a) 15
   b) 19
   c) 11
   d) 60
5. Elements in an array are accessed _____
   a) randomly
   b) sequentially
   c) exponentially
   d) logarithmically
6. What is the best case for linear search?
   a) O(nlogn)
   b) O(logn)
   c) O(n)
   d) O(1)
7. What is the worst case for linear search?
   a) O(nlogn)
   b) O(logn)
   c) O(n)
   d) O(1)

8. Which of the following is a disadvantage of linear search?
   a) Requires more space
   b) Greater time complexities compared to other searching algorithms
   c) Not easy to understand
   d) Not easy to implement
9. What is the worst case complexity of bubble sort?
   a) O(nlogn)
   b) O(logn)
   c) O(n)
   d) $O(n^2)$
10. Which matrix has most of the elements (not all) as Zero?
   a) Identity Matrix
   b) Unit Matrix
   c) Sparse Matrix
   d) Zero Matrix
11. The matrix contains m rows and n columns. The matrix is called Sparse Matrix if _____
   a) Total number of Zero elements > (m*n)/2
   b) Total number of Zero elements = m + n
   c) Total number of Zero elements = m/n
   d) Total number of Zero elements = m-n
12. Which of the following is not the method to represent Sparse Matrix?
   a) Dictionary of Keys
   b) Linked List
   c) Array
   d) Heap
13. What is a sparse array?
   a) Data structure for representing arrays of records
   b) Data structure that compactly stores bits
   c) An array in which most of the elements have the same value
   d) An array in which memory is allocated in run time
14. Two main measures for the efficiency of an algorithm are
   a) Processor and memory
   b) Time and space
   c) Date and space
   d) Complexity and capacity
15. Which of the following data structure is non linear data structure?
   a) Array
   b) Linked List
   c) Strings

d) Tree

16. Which of the following data structure is linear data structure?
    a) Graph
    b) Strings
    c) Linked lList
    d) Tree
17. The number of comparisons done by sequential search is -------
    a) (n/2)+1
    b) (n+1)/2
    c) (n-1)/2
    d) (n+2)/2
18. The memory address of the first element of an array is called
    a) Floor address
    b) Foundation address
    c) Base address
    d) Primary address
19. The memory address of fifth element of an array can be calculated by the formula
    a) LOC(Array[5])=Base(Array)+w(5-lower bound)
    b) LOC(Array[5])=Base(Array[5])+(5-lower bound)
    c) LOC(Array[5])=Base(Array[4])+w(5-upper bound)
    d) LOC(Array[5])=Base(Array)-w(5+lower bound)
20. The complexity of binary search algorithm is
    a) O(n)
    b) $O(\log_2 n)$
    c) $O(n^{2)}$
    d) O(n log n)
21. The complexity of bubble sort algorithm is
    a) O(n)
    b) $O(\log_2 n)$
    c) $O(n^{2)}$
    d) O(n log n)
22. The complexity of Insertion sort algorithm is

a. O(n)
b. $O(\log_2 n)$
c. $O(n^{2)}$
d. O(n log n)

23. The complexity of selection sort algorithm is
    a. O(n)
    b. $O(\log_2 n)$
    c. $O(n^{2)}$

d. O(n log n)

24. The elements of an array are stored successively in memory cells because
    a) By this way computer can keep track only the address of the first element and the addresses of other elements can be calculated
    b) The architecture of computer memory does not allow arrays to store
    c) Both of above
    d) None of above
25. Which of the following is the address of 4^{th} element of Y[-2:7],if base address of array Y is 1000 and each element takes 4 memory cells
    a) 1011
    b) 1024
    c) 1012
    d) 1008

26. What is the address of A[2][10] element of A[10 x 20],if base address of array A is 1000 and each element takes 4 memory cells using Row major storage?
    a) 1110
    b) 1210
    c) 1116
    d) 1020

27. What is the address of A[2][10] element of A[10:20],if base address of array A is 1000 and each element takes 4 memory cells using Column major storage?
    a. 1120
    b. 1364
    c. 1116
    d. 1020
28. Match the followings
    a. Completeness — i) How long does it takes to find a solution
    b. Time complexity — ii) How much memory need to perform the task
    c. Space complexity — iii) Is the strategy guaranteed to find the solution when there is one
    a) a-iii , b-ii , c-i
    b) a-i , b-ii , c-iii
    c) a-iii , b-i , c-ii
    d) a-i , b-iii , c-ii

29. Time Complexity means ---------
    a. How much memory need to perform the task
    b. How long does it takes to find a solution

c. Is the strategy guaranteed to find the solution when there is one technique given
d. Finding the memory address

30. Space complexity means --------
a. How much memory need to perform the task
b. Finding the memory address
c. How long does it takes to find a solution
d. Is the strategy guaranteed to find the solution when there is one technique given

31. In case of upper triangular matrix M of the order n x n , there will be atmost ---------- non-zero entries
a. n*(n-1)/2
b. n+(n-1)/2
c. n*(n+1)/2
d. n-(n*n+1)/2

32. A matrix is said to be Lower triangular matrix if and only if
a. M[i,j] =0 for i > j.
b. M[i,j] =0 for i != j
c. M[i,j] =0 for i< j
d. M[i,j] =0 for i== j

33. A matrix is said to be Upper triangular matrix if and only if
a. M[i,j] =0 for i > j.
b. M[i,j] =0 for i != j
c. M[i,j] =0 for i< j
d. M[i,j] =0 for i== j

34. A matrix is said to be Diagonal matrix if and only if
a. M[i,j] =0 for i > j.
b. M[i,j] =0 for i != j
c. M[i,j] =0 for i< j
d. M[i,j] =0 for i== j

35. 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

36. Which of the following is not a primitive data structure?
a. Boolean
b. Integer
c. Character
d. Arrays

UNIT - II

1. In linked list each node contain minimum of two fields. One field is data field to store the data second field is?
   a) Pointer to character
   b) Pointer to integer
   c) Pointer to node
   d) Node
2. What would be the asymptotic time complexity to insert an element at the front of the linked list (head is known)?
   a) O(1)
   b) O(n)
   c) $O(n^2)$
   d) $O(n^3)$
3. Consider the following definition in c programming language

```
struct node
{
   int data;
   struct node * next;
}
typedef struct node NODE;
NODE *ptr;
```

   Which of the following c code is used to create new node?
   a) ptr = (NODE*)malloc(sizeof(NODE));
   b) ptr = (NODE*)malloc(NODE);
   c) ptr = (NODE*)malloc(sizeof(NODE*));
   d) ptr = (NODE)malloc(sizeof(NODE));
4. Linked lists are not suitable to for the implementation of?
   a) Insertion sort
   b) Radix sort
   c) Polynomial manipulation
   d) Binary search
5. Linked list is considered as an example of _____ type of memory allocation.
   a) Dynamic
   b) Static
   c) Compile time
   d) Heap
6. Linked list data structure offers considerable saving in _____
   a) Computational Time
   b) Space Utilization

c) Space Utilization and Computational Time
d) Speed Utilization

7. What is the time complexity to count the number of elements in the linked list?
   a) O(1)
   b) O(n)
   c) O(logn)
   d) $O(n^2)$
8. Which of the following is false about a doubly linked list?
   a) We can navigate in both the directions
   b) It requires more space than a singly linked list
   c) The insertion and deletion of a node take a bit longer
   d) Implementing a doubly linked list is easier than singly linked list
9. 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) Head node is known in circular linked list
10. 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) Implement Hash Tables
11. 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) We can traverse the whole circular linked list by starting any point
12. The situation when in a linked list START==NULL is
    a. Underflow
    b. Overflow
    c. Housefull
    d. Saturated
13. Linked list are best suited
    a. For relatively permanent collection of data
    b. For the size of structure and data in the structure are constantly changing
    c. For both of above
    d. For none of above
14. Which of the following type of list is best suitable for accessing the last element of the linked list
    a. One-way linked list

b. Doubly linked list
c. Circular linked list
d. Header linked list

15. Memory allocation is the operation of
    a. Deleting the memory of the node from linked list
    b. Assessing memory of free node from the pool
    c. De allocating the node from free list
    d. None of the above
16. A linked list index is ____ that represents the position of a node in a linked list.
    A. An Integer
    B. a variable
    C. a character
    D. a Boolean
17. In linked lists there are no NULL links in:
    a. Single linked list
    b. Linear doubly linked list
    c. circular linked list
    d. Header linked list
18. Which of these is not an application of linked list?
    a. To implement file systems
    b. For separate chaining in hash-tables
    c. To implement non-binary trees
    d. Random Access of elements
19. What is the worst case time complexity of inserting a node in a doubly linked list?
    a. O(nlogn)
    b. O(logn)
    c. O(n)
    d. O(1)

20. A linear collection of data elements where the linear node is given by means of pointer is called?

a) Linked list
b) Node list
c) Primitive list
d) Unordered list

21. What would be the asymptotic time complexity to add a node at the end of singly linked list, if the pointer is initially pointing to the head of the list?

a) O(1)
b) O(n)

c) θ(n)
d) θ(1)

22. The concatenation of two list can performed in O(1) time. Which of the following variation of linked list can be used?
a) Singly linked list
b) Doubly linked list
c) Circular doubly linked list
d) Array implementation of list

23. What kind of linked list is best to answer question like "What is the item at position n?"
a) Singly linked list
b) Doubly linked list
c) Circular linked list
d) Array implementation of linked list

24. Which of the following points is/are not true about Linked List data structure when it is compared with array?
a) Arrays have better cache locality that can make them better in terms of performance
b) It is easy to insert and delete elements in Linked List
c) Random access is not allowed in a typical implementation of Linked Lists
d) Access of elements in linked list takes less time than compared to arrays

25. Which of the following sorting algorithms can be used to sort a random linked list with minimum time complexity?
a) Insertion Sort
b) Quick Sort
c) Heap Sort
d) Merge Sort

26. 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

27. You are given pointers to first and last nodes of a singly linked list, which of the following operations are dependent on the length of the linked list?
a) Delete the first element
b) Insert a new element as a first element
c) Delete the last element of the list
d) Add a new element at the end of the list

UNIT –III

1. Process of inserting an element in stack is called _____
   a) Create
   b) Push
   c) Evaluation
   d) Pop
2. Process of removing an element from stack is called _____
   a) Create
   b) Push
   c) Evaluation
   d) Pop
3. In a stack, if a user tries to remove an element from empty stack it is called _____
   a) Underflow
   b) Empty collection
   c) Overflow
   d) Garbage Collection
4. Pushing an element into stack already having five elements and stack size of 5, then stack becomes
   a) Overflow
   b) Crash
   c) Underflow
   d) User flow
5. Entries in a stack are "ordered". What is the meaning of this statement?
   a) A collection of stacks is sortable
   b) Stack entries may be compared with the '<' operation
   c) The entries are stored in a linked list
   d) There is a Sequential entry that is one by one
6. Which of the following is not the application of stack?
   a) A parentheses balancing program
   b) Tracking of local variables at run time
   c) Compiler Syntax Analyzer
   d) Data Transfer between two asynchronous process
7. What is the value of the postfix expression 6 3 2 4 + – *?
   a) 1
   b) 40
   c) 74
   d) -18

8. Here is an infix expression: 4 + 3*(6*3-12). Suppose that we are using the usual stack algorithm to convert the expression from infix to postfix notation.
   The maximum number of symbols that will appear on the stack AT ONE TIME during the conversion of this expression?
   a) 1
   b) 2
   c) 3
   d) 4
9. The postfix form of the expression (A+ B)*(C*D- E)*F / G is?
   a) AB+ CD*E – FG /**
   b) AB + CD* E – F **G /
   c) AB + CD* E – *F *G /
   d) AB + CDE * – * F *G /
10. The data structure required to check whether an expression contains balanced parenthesis is?
   a) Stack
   b) Queue
   c) Array
   d) Tree
11. What data structure would you mostly likely see in a non recursive implementation of a recursive algorithm?
   a) Linked List
   b) Stack
   c) Queue
   d) Tree
12. 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
13. The postfix form of A*B+C/D is?
   a) *AB/CD+
   b) AB*CD/+
   c) A*BC+/D
   d) ABCD+/*
14. Which data structure is needed to convert infix notation to postfix notation?
   a) Branch
   b) Tree

c) Queue
d) Stack

15. The prefix form of A-B/ (C * D ^ E) is?
    a) -/*^ACBDE
    b) -ABCD*^DE
    c) -A/B*C^DE
    d) -A/BC*^DE
16. The prefix form of an infix expression (p + q) – (r * t) is?
    a) + pq – *rt
    b) – +pqr * t
    c) – +pq * rt
    d) – + * pqrt
17. Which data structure is used for implementing recursion?
    a) Queue
    b) Stack
    c) Array
    d) List
18. The result of evaluating the postfix expression 5, 4, 6, +, *, 4, 9, 3, /, +, * is?
    a) 600
    b) 350
    c) 650
    d) 588
19. Convert the following infix expressions into its equivalent postfix expressions
    (A + B ∧D)/(E – F)+G
    a) (A B D ∧ + E F – / G +)
    b) (A B D +∧ E F – / G +)
    c) (A B D ∧ + E F/- G +)
    d) (A B D E F + ∧ / – G +)
20. Which of the following statement(s) about stack data structure is/are NOT correct?
    a) Linked List are used for implementing Stacks
    b) Top of the Stack always contain the new node
    c) Stack is the FIFO data structure
    d) Null link is present in the last node at the bottom of the stack
21. Consider the following operation performed on a stack of size 5.
    Push(1);
    Pop();
    Push(2);
    Push(3);
    Pop();
    Push(4);

Pop();
Pop();
Push(5);
After the completion of all operation, the number of elements present in stack are
a) 1
b) 2
c) 3
d) 4

22. Which of the following is not an inherent application of stack?
    a) Reversing a string
    b) Evaluation of postfix expression
    c) Implementation of recursion
    d) Job scheduling
23. The type of expression in which operator succeeds its operands is?
    a) Infix Expression
    b) Prefix Expression
    c) Postfix Expression
    d) Both Prefix and Postfix Expressions
24. If the elements “A”, “B”, “C” and “D” are placed in a stack and are deleted one at a time, what is the order of removal?
    a) ABCD
    b) DCBA
    c) DCAB
    d) ABDC
25. Which of the following real world scenarios would you associate with a stack data structure?
    a) piling up of chairs one above the other
    b) people standing in a line to be serviced at a counter
    c) offer services based on the priority of the customer
    d) tatkal Ticket Booking in IRCTC
26. What does ‘stack underflow’ refer to?
    a) accessing item from an undefined stack
    b) adding items to a full stack
    c) removing items from an empty stack
    d) index out of bounds exception
27. What is the time complexity of pop() operation when the stack is implemented using an array?
    a) O(1)
    b) O(n)

c) O(logn)
d) O(nlogn)

28. Which of the following array position will be occupied by a new element being pushed for a stack of size N elements(capacity of stack > N).
    a) S[N-1]
    b) S[N]
    c) S[1]
    d) S[0]
29. Array implementation of Stack is not dynamic, which of the following statements supports this argument?
    a) space allocation for array is fixed and cannot be changed during run-time
    b) user unable to give the input for stack operations
    c) a runtime exception halts execution
    d) improper program compilation
30. Which of the following array element will return the top-of-the-stack-element for a stack of size N elements(capacity of stack > N).
    a) S[N-1]
    b) S[N]
    c) S[N-2]
    d) S[N+1]
31. Consider these functions:
    push() : push an element into the stack
    pop() : pop the top-of-the-stack element
    top() : returns the item stored in top-of-the-stack-node
    What will be the output after performing these sequence of operations

```
push(20);
push(4);
top();
pop();
pop();
pop();
push(5);
top();
```

    a) 20
    b) 4
    c) stack underflow
    d) 5
32. A linear list of elements in which deletion can be done from one end (front) and insertion can take place only at the other end (rear) is known as a ?
    a) Queue
    b) Stack
    c) Tree
    d) Linked list

33. The data structure required for Breadth First Traversal on a graph is?
    a) Stack
    b) Array
    c) Queue
    d) Tree
34. A queue follows _____
    a) FIFO (First In First Out) principle
    b) LIFO (Last In First Out) principle
    c) Ordered array
    d) Linear tree
35. Circular Queue is also known as _____
    a) Ring Buffer
    b) Square Buffer
    c) Rectangle Buffer
    d) Curve Buffer
36. A data structure in which elements can be inserted or deleted at/from both the ends but not in the middle is?
    a) Queue
    b) Circular queue
    c) Dequeue
    d) Priority queue
37. A normal queue, if implemented using an array of size MAX_SIZE, gets full when
    a) Rear = MAX_SIZE – 1
    b) Front = (rear + 1)mod MAX_SIZE
    c) Front = rear + 1
    d) Rear = front
38. Queues serve major role in _____
    a) Simulation of recursion
    b) Simulation of arbitrary linked list
    c) Simulation of limited resource allocation
    d) Simulation of heap sort
39. Which of the following is not the type of queue?
    a) Ordinary queue
    b) Single ended queue
    c) Circular queue
    d) Priority queue
40. What is a dequeue?
    a) A queue with insert/delete defined for both front and rear ends of the queue
    b) A queue implemented with a doubly linked list

c) A queue implemented with both singly and doubly linked lists
d) A queue with insert/delete defined for front side of the queue

41. What are the applications of dequeue?
    a) A-Steal job scheduling algorithm
    b) Can be used as both stack and queue
    c) To find the maximum of all sub arrays of size k
    d) To avoid collision in hash tables
42. Which of the following is not an application of priority queue?
    a) Huffman codes
    b) Interrupt handling in operating system
    c) Undo operation in text editors
    d) Bayesian spam filter
43. Which of the following is not an advantage of priority queue?
    a) Easy to implement
    b) Processes with different priority can be efficiently handled
    c) Applications with differing requirements
    d) Easy to delete elements in any case
44. In linked list implementation of a queue, where does a new element be inserted?
    a) At the head of link list
    b) At the centre position in the link list
    c) At the tail of the link list
    d) At any position in the linked list
45. In linked list implementation of a queue, front and rear pointers are tracked. Which of these pointers will change during an insertion into a NONEMPTY queue?
    a) Only front pointer
    b) Only rear pointer
    c) Both front and rear pointer
    d) No pointer will be changed
46. In case of insertion into a linked queue, a node borrowed from the _____ list is inserted in the queue.
    a) AVAIL
    b) FRONT
    c) REAR
    d) NULL
47. In linked list implementation of a queue, from where is the item deleted?
    a) At the head of link list
    b) At the centre position in the link list
    c) At the tail of the link list
    d) Node before the tail

48. In linked list implementation of a queue, the important condition for a queue to be empty is?
    a) FRONT is null
    b) REAR is null
    c) LINK is empty
    d) FRONT==REAR-1
49. The essential condition which is checked before insertion in a linked queue is?
    a) Underflow
    b) Overflow
    c) Front value
    d) Rear value
50. The essential condition which is checked before deletion in a linked queue is?
    a) Underflow
    b) Overflow
    c) Front value
    d) Rear value
51. Which of the following is true about linked list implementation of queue?
    a) In push operation, if new nodes are inserted at the beginning of linked list, then in pop operation, nodes must be removed from end
    b) In push operation, if new nodes are inserted at the beginning, then in pop operation, nodes must be removed from the beginning
    c) In push operation, if new nodes are inserted at the end, then in pop operation, nodes must be removed from end
    d) In push operation, if new nodes are inserted at the end, then in pop operation, nodes must be removed from beginning
52. What is the need for a circular queue?
    a) effective usage of memory
    b) easier computations
    c) to delete elements based on priority
    d) implement LIFO principle in queues
53. Identify the data structure which allows deletions at both ends of the list but insertion at only one end.
    a. Input-restricted deque
    b. Output-restricted deque
    c. Priority queues
    d. Circular queues

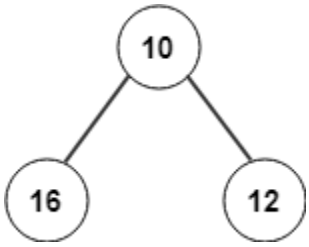
UNIT –IV

1. Disadvantages of linked list representation of binary trees over arrays?
    a) Randomly accessing is not possible

b) Extra memory for a pointer is needed with every element in the list
c) Difficulty in deletion
d) Random access is not possible and extra memory with every element

2. Which of the following traversing algorithm is not used to traverse in a tree?
   a) Post order
   b) Pre order
   c) Post order
   d) Randomized
3. How many children does a binary tree have?
   a) 2
   b) any number of children
   c) 0 or 1 or 2
   d) 0 or 1
4. What is/are the disadvantages of implementing tree using normal arrays?
   a) difficulty in knowing children nodes of a node
   b) difficult in finding the parent of a node
   c) have to know the maximum number of nodes possible before creation of trees
   d) difficult to implement
5. What must be the ideal size of array if the height of tree is ' n'?
   a) 2^n -1
   b) n -1
   c) l
   d) 2* n
6. What are the children for node 'w' of a complete-binary tree in an array representation?
   a) 2w and 2w+1
   b) 2+w and 2-w
   c) w+1/2 and w/2
   d) w-1/2 and w+1/2
7. Can a tree stored in an array using either one of inorder or post order or pre order traversals be again reformed?
   a) Yes just traverse through the array and form the tree
   b) No we need one more traversal to form a tree
   c) No in case of sparse trees
   d) Yes by using both inorder and array elements
8. What is the maximum number of children that a binary tree node can have?
   a) 0
   b) 1
   c) 2
   d) 3

9. The following given tree is an example for?



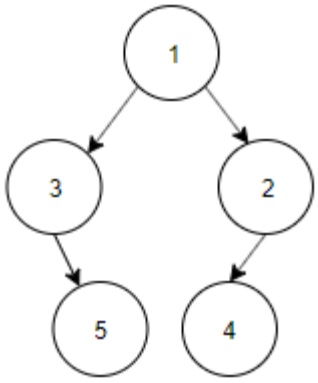
a) Binary tree
b) Binary search tree
c) Fibonacci tree
d) AVL tree

10. How many orders of traversal are applicable to a binary tree (In General)?
a) 1
b) 4
c) 2
d) 3

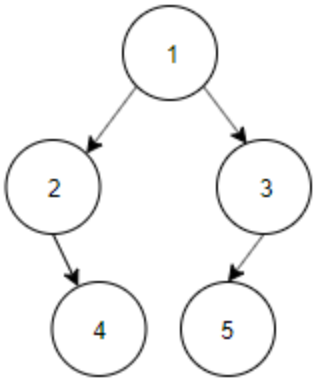
11. If binary trees are represented in arrays, what formula can be used to locate a left child, if the node has an index i?
a) 2i+1
b) 2i+2
c) 2i
d) 4i

12. Which of the following properties are obeyed by all three tree – traversals?
a) Left subtrees are visited before right subtrees
b) Right subtrees are visited before left subtrees
c) Root node is visited before left subtree
d) Root node is visited before right subtree

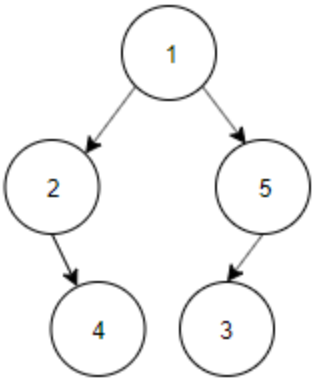
13. Construct a binary tree using the following data.
The preorder traversal of a binary tree is 1, 2, 5, 3, 4. The inorder traversal of the same binary tree is 2, 5, 1, 4, 3.
a).



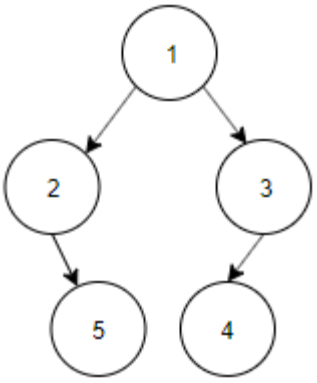
b).



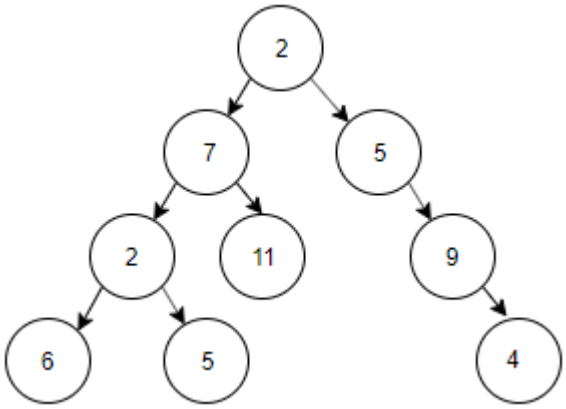
c)



d)

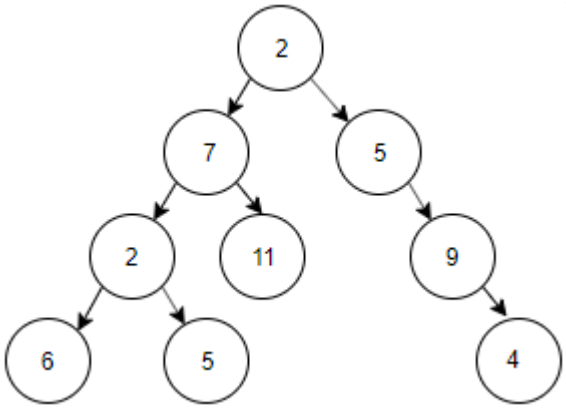


14. For the tree below, write the pre-order traversal.



a) 2, 7, 2, 6, 5, 11, 5, 9, 4
b) 2, 7, 5, 2, 6, 9, 5, 11, 4
c) 2, 5, 11, 6, 7, 4, 9, 5, 2
d) 2, 7, 5, 6, 11, 2, 5, 4, 9

15. For the tree below, write the post-order traversal.

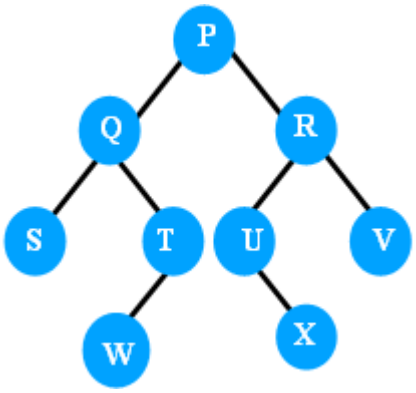


a) 2, 7, 2, 6, 5, 11, 5, 9, 4
b) 2, 7, 5, 2, 6, 9, 5, 11, 4
c) 2, 5, 11, 6, 7, 4, 9, 5, 2
d) 2, 7, 5, 6, 11, 2, 5, 4, 9

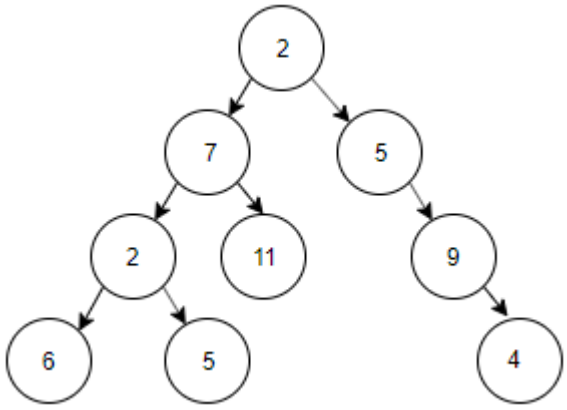
16. To obtain a prefix expression, which of the tree traversals is used?
a) Level-order traversal
b) Pre-order traversal
c) Post-order traversal
d) In-order traversal

17. The steps for finding post-order traversal are
a. traverse the right subtree, traverse the left subtree or visit the current node.
b. traverse the left subtree, traverse the right subtree and visit root
c. traverse the left subtree, visit root and traverse the right subtree
d. visit root , traverse the left subtree and traverse the right subtree

18. The pre-order and in-order are traversals of a binary tree are T M L N P O Q and L M N T O P Q. Which of following is post-order traversal of the tree?
    a) L N M O Q P T
    b) N M O P O L T
    c) L M N O P Q T
    d) O P L M N Q T
19. Find the postorder traversal of the binary tree shown below.

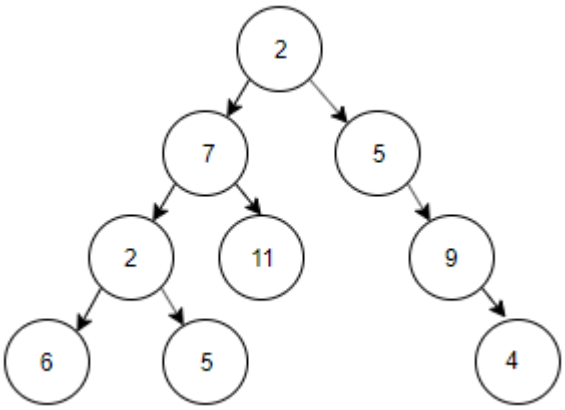


    a) P Q R S T U V W X
    b) W R S Q P V T U X
    c) S W T Q X U V R P
    d) S T W U X V Q R P
20. For the tree below, write the in-order traversal.



    a) 6, 2, 5, 7, 11, 2, 5, 9, 4
    b) 6, 5, 2, 11, 7, 4, 9, 5, 2
    c) 2, 7, 2, 6, 5, 11, 5, 9, 4
    d) 2, 7, 6, 5, 11, 2, 9, 5, 4

21. For the tree below, write the level-order traversal.



a) 2, 7, 2, 6, 5, 11, 5, 9, 4
b) 2, 7, 5, 2, 11, 9, 6, 5, 4
c) 2, 5, 11, 6, 7, 4, 9, 5, 2
d) 2, 7, 5, 6, 11, 2, 5, 4, 9

22. Which of the following graph traversals closely imitates level order traversal of a binary tree?
a) Depth First Search
b) Breadth First Search
c) Depth & Breadth First Search
d) Binary Search

23. In a binary search tree, which of the following traversals would print the numbers in the ascending order?
a) Level-order traversal
b) Pre-order traversal
c) Post-order traversal
d) In-order traversal

24. The number of edges from the root to the node is called _____ of the tree.
a) Height
b) Depth
c) Length
d) Width

25. The number of edges from the node to the deepest leaf is called _____ of the tree.
a) Height
b) Depth
c) Length
d) Width

26. What is a full binary tree?
a) Each node has exactly zero or two children
b) Each node has exactly two children

c) All the leaves are at the same level

d) Each node has exactly one or two children

27. What is a complete binary tree?

a) Each node has exactly zero or two children

b) A binary tree, which is completely filled, with the possible exception of the bottom level, which is filled from right to left

c) A binary tree, which is completely filled, with the possible exception of the bottom level, which is filled from left to right

d) A tree In which all nodes have degree 2

28. Which of the following is not an advantage of trees?

a) Hierarchical structure

b) Faster search

c) Router algorithms

d) Undo/Redo operations in a notepad

29. Which of the following is incorrect with respect to binary trees?

a) Let T be a binary tree. For every $k \geq 0$, there are no more than 2k nodes in level k

b) Let T be a binary tree with λ levels. Then T has no more than $2^{\lambda - 1}$ nodes

c) Let T be a binary tree with N nodes. Then the number of levels is at least ceil(log (N + 1))

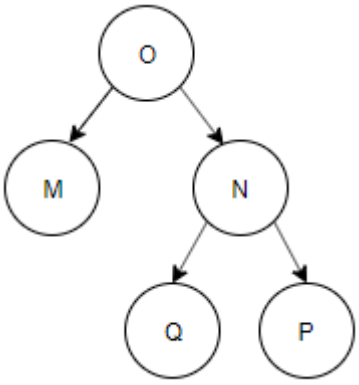
d) Let T be a binary tree with N nodes. Then the number of levels is at least floor(log (N + 1))

30. Construct a binary tree by using postorder and inorder sequences given below.

Inorder: N, M, P, O, Q

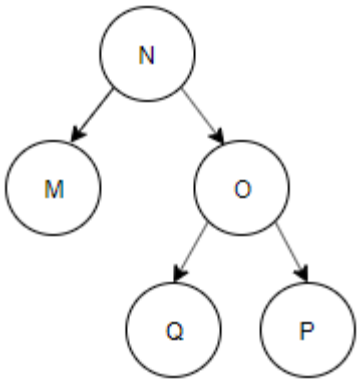
Postorder: N, P, Q, O, M

er: N, P, Q, O, M

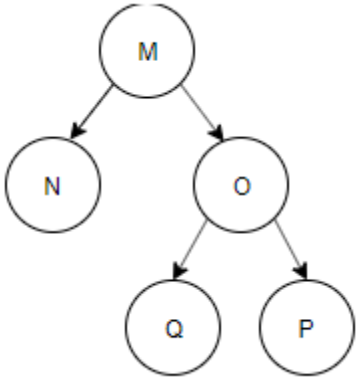


a)

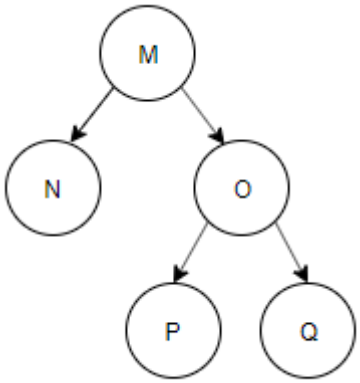
b)



c)



d)



31. Which of the following is false about a binary search tree?
    a) The left child is always lesser than its parent
    b) The right child is always greater than its parent
    c) The left and right sub-trees should also be binary search trees
    d) In order sequence gives decreasing order of elements
32. What is the speciality about the inorder traversal of a binary search tree?
    a) It traverses in a non increasing order
    b) It traverses in an increasing order

c) It traverses in a random fashion
d) It traverses based on priority of the node

33. What are the conditions for an optimal binary search tree and what is its advantage?
a) The tree should not be modified and you should know how often the keys are accessed, it improves the lookup cost
b) You should know the frequency of access of the keys, improves the lookup time
c) The tree can be modified and you should know the number of elements in the tree before hand, it improves the deletion time
d) The tree should be just modified and improves the lookup time

34. Which of the following is the most widely used external memory data structure?
a) AVL tree
b) B-tree
c) Red-black tree
d) Both AVL tree and Red-black tree

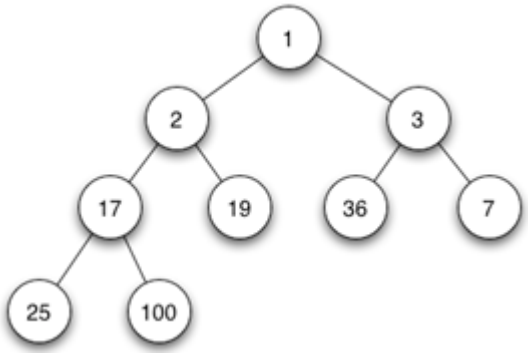
35. A B-tree of order 4 and of height 3 will have a maximum of _____ keys.
a) 255
b) 63
c) 127
d) 188

36. What is an AVL tree?
a) a tree which is balanced and is a height balanced tree
b) a tree which is unbalanced and is a height balanced tree
c) a tree with three children
d) a tree with atmost 3 children

37. 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

38. Heap can be used as _____
a) Priority queue
b) Stack
c) A decreasing order array
d) Normal Array

39.



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

40. Which one of the following array elements represents a binary min heap?
    a) 12 10 8 25 14 17
    b) 8 10 12 25 14 17
    c) 25 17 14 12 10 8
    d) 14 17 25 10 12 8
41. What will be the position of 5, when a max heap is constructed on the input elements 5, 70, 45, 7, 12, 15, 13, 65, 30, 25?
    a) 5 will be at root
    b) 5 will be at last level
    c) 5 will be at second level
    d) 5 can be anywhere in heap
42. What is the worst case complexity of binary search using recursion?
    a) O(nlogn)
    b) O(logn)
    c) O(n)
    d) $O(n^2)$
43. Which of the following is not an application of binary search?
    a) To find the lower/upper bound in an ordered sequence
    b) Union of intervals
    c) Debugging
    d) To search in unordered list
44. How many passes does an insertion sort algorithm consist of?
    a) N
    b) N-1

c) N+1
d) N^2

45. What is an in-place sorting algorithm?
    a) It needs O(1) or O(logn) memory to create auxiliary locations
    b) The input is already sorted and in-place
    c) It requires additional storage
    d) It requires additional space
46. In the following scenarios, when will you use selection sort?
    a) The input is already sorted
    b) A large file has to be sorted
    c) Large values need to be sorted with small keys
    d) Small values need to be sorted with large keys
47. What is the advantage of selection sort over other sorting techniques?
    a) It requires no additional storage space
    b) It is scalable
    c) It works best for inputs which are already sorted
    d) It is faster than any other sorting technique
48. Merge sort uses which of the following technique to implement sorting?
    a) backtracking
    b) greedy algorithm
    c) divide and conquer
    d) dynamic programming
49. hich of the following sorting algorithms is the fastest?
    a) Merge sort
    b) Quick sort
    c) Insertion sort
    d) Shell sort
50. What is an external sorting algorithm?
    a) Algorithm that uses tape or disk during the sort
    b) Algorithm that uses main memory during the sort
    c) Algorithm that involves swapping
    d) Algorithm that are considered ‘in place’
51. What is an internal sorting algorithm?
    a) Algorithm that uses tape or disk during the sort
    b) Algorithm that uses main memory during the sort
    c) Algorithm that involves swapping
    d) Algorithm that are considered ‘in place’
52. The given array is arr = {1, 2, 4, 3}. Bubble sort is used to sort the array elements. How many iterations will be done to sort the array?
    a) 4

b) 2
c) 1
d) 0

53. Which of the following ways below is a pre order traversal?
    A. Root->left sub tree-> right sub tree
    B. Root->right sub tree-> left sub tree
    C. right sub tree-> left sub tree->Root
    D. left sub tree-> right sub tree->Root
54. Which of the following ways below is a In order traversal?
    A. Root->left sub tree-> right sub tree
    B. Root->right sub tree-> left sub tree
    C. right sub tree-> left sub tree->Root
    D. left sub tree-> root->right sub tree
55. In _____ tree, the heights of the two child subtrees of any node differ by at most one
    A. Binary tree
    B. Red black tree
    C. Splay tree
    D. AVL tree
56. The depth of a complete binary tree is given by
    a. Dn = n log2n
    b. Dn = n log2n+1
    c. Dn = log2n
    d. Dn = log2n+1

UNIT -V

1. What is the number of edges present in a complete graph having n vertices?
    a) (n*(n+1))/2
    b) (n*(n-1))/2
    c) n
    d) Information given is insufficient
2. 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) Must have no multiple edges
3. 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

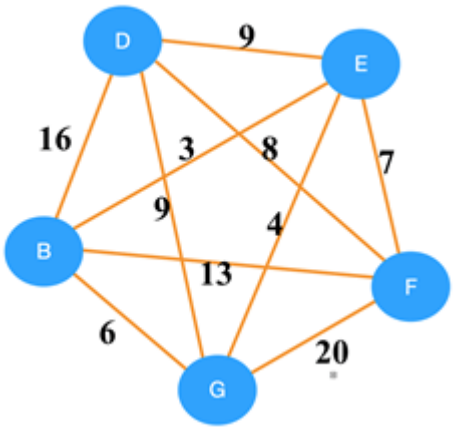
b) v = e+1
c) v + 1 = e
d) v = e-1

4. 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) No way to represent
5. How many of the following statements are correct?
   i) All cyclic graphs are complete graphs.
   ii) All complete graphs are cyclic graphs.
   iii) All paths are bipartite.
   iv) All cyclic graphs are bipartite.
   v) There are cyclic graphs which are complete.
   a) 1
   b) 2
   c) 3
   d) 4
6. A graph having an edge from each vertex to every other vertex is called a _____
   a) Tightly Connected
   b) Strongly Connected
   c) Weakly Connected
   d) Loosely Connected
7. Depth First Search is equivalent to which of the traversal in the Binary Trees?
   a) Pre-order Traversal
   b) Post-order Traversal
   c) Level-order Traversal
   d) In-order Traversal
8. The Data structure used in standard implementation of Breadth First Search is?
   a) Stack
   b) Queue
   c) Linked List
   d) Tree
9. A person wants to visit some places. He starts from a vertex and then wants to visit every vertex till it finishes from one vertex, backtracks and then explore other vertex from same vertex. What algorithm he should use?
   a) Depth First Search
   b) Breadth First Search
   c) Trim's algorithm
   d) Kruskal's Algorithm

10. In Depth First Search, how many times a node is visited?
    a) Once
    b) Twice
    c) Equivalent to number of indegree of the node
    d) Thrice
11. Breadth First Search is equivalent to which of the traversal in the Binary Trees?
    a) Pre-order Traversal
    b) Post-order Traversal
    c) Level-order Traversal
    d) In-order Traversal
12. The Data structure used in standard implementation of Breadth First Search is?
    a) Stack
    b) Queue
    c) Linked List
    d) Tree
13. A person wants to visit some places. He starts from a vertex and then wants to visit every place connected to this vertex and so on. What algorithm he should use?
    a) Depth First Search
    b) Breadth First Search
    c) Trim's algorithm
    d) Kruskal's algorithm
14. Which of the following is not an application of Breadth First Search?
    a) Finding shortest path between two nodes
    b) Finding bipartiteness of a graph
    c) GPS navigation system
    d) Path Finding
15. Which of the following is false in the case of a spanning tree of a graph G?
    a) It is tree that spans G
    b) It is a subgraph of the G
    c) It includes every vertex of the G
    d) It can be either cyclic or acyclic
16. Consider a complete graph G with 4 vertices. The graph G has ____ spanning trees.
    a) 15
    b) 8
    c) 16
    d) 13
17. The travelling salesman problem can be solved using _____
    a) A spanning tree
    b) A minimum spanning tree

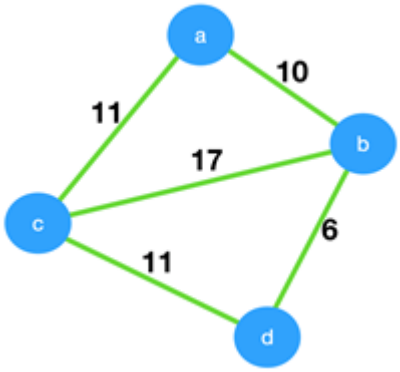
c) Bellman – Ford algorithm
d) DFS traversal

18. Which of the following is not the algorithm to find the minimum spanning tree of the given graph?
    a) Boruvka's algorithm
    b) Prim's algorithm
    c) Kruskal's algorithm
    d) Bellman–Ford algorithm
19. Which of the following is false?
    a) The spanning trees do not have any cycles
    b) MST have n – 1 edges if the graph has n edges
    c) Edge e belonging to a cut of the graph if has the weight smaller than any other edge in the same cut, then the edge e is present in all the MSTs of the graph
    d) Removing one edge from the spanning tree will not make the graph disconnected
20. Kruskal's algorithm is used to _____
    a) find minimum spanning tree
    b) find single source shortest path
    c) find all pair shortest path algorithm
    d) traverse the graph
21. Kruskal's algorithm is a _____
    a) divide and conquer algorithm
    b) dynamic programming algorithm
    c) greedy algorithm
    d) approximation algorithm
22. Consider the following graph. Using Kruskal's algorithm, which edge will be selected first?



    a) GF
    b) DE
    c) BE
    d) BG

23. Which of the following is false about the Kruskal's algorithm?
    a) It is a greedy algorithm
    b) It constructs MST by selecting edges in increasing order of their weights
    c) It can accept cycles in the MST
    d) It uses union-find data structure
24. Which of the following is true?
    a) Prim's algorithm initialises with a vertex
    b) Prim's algorithm initialises with a edge
    c) Prim's algorithm initialises with a vertex which has smallest edge
    d) Prim's algorithm initialises with a forest
25. Consider the given graph.

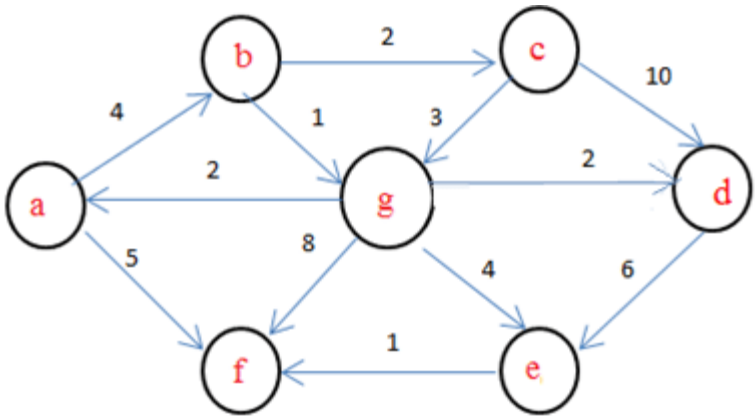


    What is the weight of the minimum spanning tree using the Prim's algorithm,starting from vertex a?
    a) 23
    b) 28
    c) 27
    d) 11
26. Which of the following is false about Prim's algorithm?
    a) It is a greedy algorithm
    b) It constructs MST by selecting edges in increasing order of their weights
    c) It never accepts cycles in the MST
    d) It can be implemented using the Fibonacci heap
27. Dijkstra's Algorithm is used to solve _____ problems.
    a) All pair shortest path
    b) Single source shortest path
    c) Network flow
    d) Sorting
28. Dijkstra's Algorithm cannot be applied on _____
    a) Directed and weighted graphs
    b) Graphs having negative weight function

c) Unweighted graphs

d) Undirected and unweighted graphs

29. Consider the following graph.



If b is the source vertex, what is the minimum cost to reach f vertex?

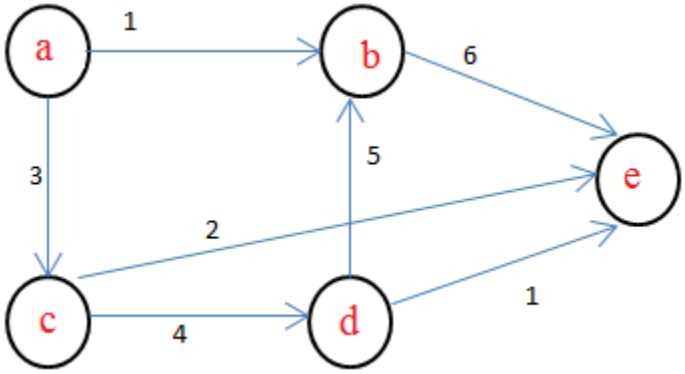
a) 8

b) 9

c) 4

d) 6

30. In the given graph:



Identify the shortest path having minimum cost to reach vertex E if A is the source vertex

a) a-b-e

b) a-c-e

c) a-c-d-e

d) a-c-d-b-e

31. Key value pair is usually seen in

A. Hash tables

B. Heaps

C. Both a and b

D. Skip list

32. If every node u in G is adjacent to every other node v in G, A graph is said to be

a. isolated

b. complete
c. finite
d. strongly connected