MCQs on TREE DATA structure

1. **The height of a BST is given as h. Consider the height of the tree as the no. of edges in the longest path from root to the leaf. The maximum no. of nodes possible in the tree is?**

   a) 2^{h-1} -1
   b) 2^{h+1} -1
   c) 2^{h} +1
   d) 2^{h-1} +1

   ANSWER: b) 2^{h+1} -1

2. **The no of external nodes in a full binary tree with n internal nodes is?**

   a) n
   b) n+1
   c) 2n
   d) 2n + 1

   ANSWER: b) n+1

3. **The difference between the external path length and the internal path length of a binary tree with n internal nodes is?**

   a) 1
   b) n
   c) n + 1
   d) 2n

   ANSWER: d) 2n

4. **Suppose a binary tree is constructed with n nodes, such that each node has exactly either zero or two children. The maximum height of the tree will be?**

   a) (n+1)/2
   b) (n-1)/2
   c) n/2 -1
   d) (n+1)/2 -1

   ANSWER: b) (n-1)/2

5. **Which of the following statement about binary tree is CORRECT?**

   a) Every binary tree is either complete or full
   b) Every complete binary tree is also a full binary tree
   c) Every full binary tree is also a complete binary tree
   d) A binary tree cannot be both complete and full

ANSWER: c) Every full binary tree is also a complete binary tree

6. **Suppose we have numbers between 1 and 1000 in a binary search tree and want to search for the number 363. Which of the following sequence could not be the sequence of the node examined?**

   a) 2, 252, 401, 398, 330, 344, 397, 363
   b) 924, 220, 911, 244, 898, 258, 362, 363
   c) 925, 202, 911, 240, 912, 245, 258, 363
   d) 2, 399, 387, 219, 266, 382, 381, 278, 363

ANSWER: c) 925, 202, 911, 240, 912, 245, 258, 363

7. **In full binary search tree every internal node has exactly two children. If there are 100 leaf nodes in the tree, how many internal nodes are there in the tree?**

   a) 25
   b) 49
   c) 99
   d) 101

ANSWER: c) 99

8. **Which type of traversal of binary search tree outputs the value in sorted order?**

   a) Pre-order
   b) In-order
   c) Post-order
   d) None

ANSWER: b) In-order

9. **Suppose a complete binary tree has height h>0. The minimum no of leaf nodes possible in term of h is?**

    a) 2^h -1
    b) 2^{h-1} + 1
    c) 2^{h-1}
    d) 2^h +1

ANSWER: c) 2^{h-1}

10. **If a node having two children is to be deleted from binary search tree, it is replaced by its**

    a) In-order predecessor
    b) In-order successor
    c) Pre-order predecessor
    d) None

ANSWER: b) In-order successor

11. **A binary search tree is formed from the sequence 6, 9, 1, 2, 7, 14, 12, 3, 8, 18. The minimum number of nodes required to be added in to this tree to form an extended binary tree is?**

    a) 3
    b) 6
    c) 8
    d) 11

ANSWER: d) 11

12. **In a full binary tree, every internal node has exactly two children. A full binary tree with 2n+1 nodes contains**

    a) n leaf node
    b) n internal nodes
    c) n-1 leaf nodes
    d) n-1 internal nodes

ANSWER: b) n internal nodes

13. the run time for traversing all the nodes of a binary search tree with n nodes and printing them in an order is

a) O(nlg(n))
b) O(n)
c) O(√n)
d) O(log(n))

ANSWER: b) O(n)

14. When a binary tree is converted in to an extended binary tree, all the nodes of a binary tree in the external node becomes

a) Internal nodes
b) External nodes
c) Root nodes
d) None

ANSWER: a) Internal nodes

15. If n numbers are to be sorted in ascending order in O(nlogn) time, which of the following tree can be used

a) Binary tree
b) Binary search tree
c) Max-heap
d) Min-heap

ANSWER: d) Min-heap

16. If n elements are sorted in a binary search tree. What would be the asymptotic complexity to search a key in the tree?

a) O(1)
b) O(logn)
c) O(n)
d) O(nlogn)

ANSWER: c) O(n)

17. If n elements are sorted in a balanced binary search tree. What would be the asymptotic complexity to search a key in the tree?

a) O(1)
b) O(logn)
c) O(n)
d) O(nlogn)
ANSWER: b) O(logn)

18. A threaded binary tree is a binary tree in which every node that does not have right child has a thread to its

a) Pre-order successor
b) In-order successor
c) In-order predecessor
d) Post-order successor

ANSWER: b) In-order successor

19. In which of the following tree, parent node has a key value greater than or equal to the key value of both of its children?

a) Binary search tree
b) Threaded binary tree
c) Complete binary tree
d) Max-heap

ANSWER: d) Max-heap

20. A binary tree T has n leaf nodes. The number of nodes of degree 2 in T is

a) $\log_2 n$
b) n-1
c) n
d) 2^n

ANSWER: b) n-1

21. A binary search 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 the node in the left sub-tree and right sub-tree of the root, respectively, is

a) (4, 7)
b) (7, 4)
c) (8, 3)
d) (3, 8)

ANSWER: b) (7, 4)

22. The post order traversal of binary tree is DEBFCA. Find out the pre order traversal.

A. ABFCDE

B. ADBFEC

C. ABDECF

D. ABDCEF

Answer: C. ABDECF

23. While converting binary tree into extended binary tree, all the original nodes in binary tree are .....

A. Internal nodes on extended tree

B. External nodes on extended tree

C. Vanished on extended tree

D. Intermediate nodes on extended tree

Answer:A. Internal nodes on extended tree

24. The in-order traversal of tree will yield a sorted listing of elements of tree in .....

A. binary trees

B. binary search trees

C. heaps

D. binary heaps

Answer: B. binary search trees

25. In a binary tree, certain null entries are replaced by special pointers which point to nodes higher in the tree for efficiency. These special pointers are called .....

A. Leaf

B. Branch

C. Path

D. Thread

Answer: D. Thread

26. In a graph if e=(u,v) means .....

A. u is adjacent to v but v is not adjacent to u.

B. e begins at u and ends at v

C. u is node and v is an edge.

D. both u and v are edges.

Answer: B. e begins at u and ends at v

27. A binary tree whose every node has either zero or two children is called .....

A. Complete binary tree

B. Binary Search tree

C. Extended binary tree

D. E2 tree

Answer: C. Extended binary tree

28. 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.

Answer: B. complete

29. In a graph if e=[u,v], then u and v are called

A. endpoints of e

B. adjacent nodes

C. neighbours

D. all of the above

Answer: D. all of the above

30. In-order traversing a tree resulted E A C K F H D B G; the pre-order traversal would return.

A. FAEKCDBHG

B. FAEKCDHGB

C. EAFKHDCBG

D. FEAKDCHBG

Answer: B. FAEKCDHGB

31. A connected graph T without any cycles is called .

A. a tree graph

B. free tree

C. a tree

D. All of above

Answer: D. All of above

32. In linked representation of Binary trees LEFT[k] contains the ..... of at the node N, where k is the location.

A. Data

B. Location and left child

C. Right child address

D. Null value

Answer: A. Data

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

A. isolated

B. complete

C. finite

D. strongly connected

Answer: B. complete

34. Three standards ways of traversing a binary tree T with root R .....

A. Prefix, infix, postfix

B. Pre-process, in-process, post-process

C. Pre-traversal, in-traversal, post-traversal

D. Pre-order, in-order, post-order

Answer: D. Pre-order, in-order, post-order

35. In threaded binary tree ..... points to higher nodes in tree.

A. Info

B. Root

C. Threads

D. Child

Answer: C. Threads

36. A graph is said to be ..... if its edges are assigned data.

A. Tagged

B. Marked

C. Lebeled

D. Sticked

Answer: C. Lebeled

37. If node N is a terminal node in a binary tree then its .....

A. Right tree is empty

B. Left tree is empty

C. Both left & right sub trees are empty

D. Root node is empty

Answer: C. Both left & right sub trees are empty

38. What is the maximum height of any AVL-tree with 7 nodes? Assume that the height of a tree with a single node is 0.

A. 2
B. 3
C. 4
D. 5

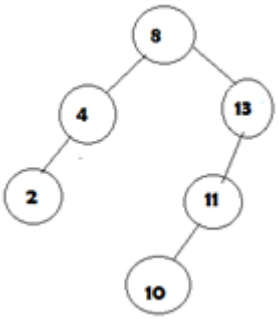
Answer: 3

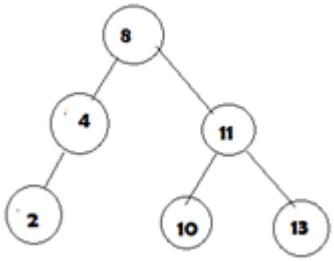
39. Why we need to a binary tree which is height balanced?

a) to avoid formation of skew trees
b) to save memory
c) to attain faster memory access
d) to simplify storing

Answer: a

40. Which of the below diagram is following AVL tree property?

i. 

ii. 

a) only i
b) only i and ii
c) only ii
d) none of the mentioned

Answer: b) only i and ii

41. What is the maximum height of an AVL tree with p nodes?

a) p
b) log(p)
c) log(p)/2
d) p/2

Answer: b) log(p)

42. Why to prefer red-black trees over AVL trees?

a) Because red-black is more rigidly balanced
b) AVL tree store balance factor in every node which costs space
c) AVL tree fails at scale
d) Red black is more efficient

Answer: b) AVL tree store balance factor in every node which costs space

43. A Binary Tree can have

A. Can have 2 children
B. Can have 1 children
C. Can have 0 children
D. All

Answer: All

44. Height of a binary tree is

A. MAX(Height of left Subtree, Height of right subtree)+1
B. MAX(Height of left Subtree, Height of right subtree)
C. MAX(Height of left Subtree, Height of right subtree)-1
D. None

Answer: A) MAX(Height of left Subtree, Height of right subtree)+1

45. Postfix expression for (A+B) *(C+D) is

A. A B C * + D +
B. A B + C D + *
C. ABCD++*
D. None

Answer: B) A B + C D + *

46. Match the following for binary tree traversal

(1) Pre Order (A)Left Right Root
(2) In Order (B)Left Root Right
(2) Post Order (C)Root Left Right

A. 1 → A, 2 → B, 3 → C
B. 1 → C, 2 → B, 3 → A
C. 1 → A, 2 → C, 3 → B
D. 1 → B, 2 → A, 3 → C

Answer: B) 1 → C, 2 → B, 3 → A

47. The operation of processing each element in the list is known as .....

A. sorting

B. merging

C. inserting

D. traversal

Answer: D. traversal

48. **Other name for directed graph is .....**

A. Direct graph

B. Digraph

C. Dir-graph

D. Digraph

Answer: B. Digraph

49. Binary trees with threads are called as .....

A. Threaded trees

B. Pointer trees

C. Special trees

D. Special pointer trees

Answer: A. Threaded trees

50. Graph G is ..... if for any pair u, v of nodes in G there is a path from u to v or path from v to u.

A. Leterally connected

B. Widely Connected

C. Unliterally connected

D. Literally connected

Answer: C. Unliterally connected

51. In Binary trees nodes with no successor are called .....

A. End nodes

B. Terminal nodes

C. Final nodes

D. Last nodes

Answer: B. Terminal nodes

52. A connected graph T without any cycles is called .....

A. free graph

B. no cycle graph

C. non cycle graph

D. circular graph

Answer: A. free graph

53. Trees are said ..... if they are similar and have same contents at corresponding nodes.

A. Duplicate

B. Carbon copy

C. Replica

D. Copies

Answer: D. Copies

54. A connected graph T without any cycles is called a .....

A. A tree graph

B. Free tree

C. A tree d

D. All of the above

Answer: D. All of the above

55. Every node N in a binary tree T except the root has a unique parent called the ..... of N.

A. Antecedents

B. Predecessor

C. Forerunner

D. Precursor

Answer: B. Predecessor

56. In a graph if E=(u,v) means .....

A. u is adjacent to v but v is not adjacent to u

B. e begins at u and ends at v

C. u is predecessor and v is successor

D. both b and c

Answer: D. both b and c

57. Sequential representation of binary tree uses .....

A. Array with pointers

B. Single linear array

C. Two dimentional arrays

D. Three dimentional arrays

Answer: A. Array with pointers

58. TREE[1]=NULL indicates tree is .....

A. Overflow

B. Underflow

C. Empty

D. Full

Answer: C. Empty

59. A binary tree whose every node has either zero or two children is called .....

A. complete binary tree

B. binary search tree

C. extended binary tree

D. data structure

Answer: C. extended binary tree

60. Linked representation of binary tree needs ..... parallel arrays.

A. 4

B. 2

C. 3

D. 5

Answer: C. 3

61. The depth of complete binary tree is given by .....

A. Dn = n log2n

B. Dn= n log2n+1

C. Dn = log2n

D. Dn = log2n+1

Answer: D. Dn = log2n+1

62. Which indicates pre-order traversal?

A. Left sub-tree, Right sub-tree and root

B. Right sub-tree, Left sub-tree and root

C. Root, Left sub-tree, Right sub-tree

D. Right sub-tree, root, Left sub-tree

Answer: C. Root, Left sub-tree, Right sub-tree

63. In a extended-binary tree nodes with 2 children are called .....

A. Interior node

B. Domestic node

C. Internal node

D. Inner node

Answer: C. Internal node

64. A terminal node in a binary tree is called .....

A. Root

B. Leaf

C. Child

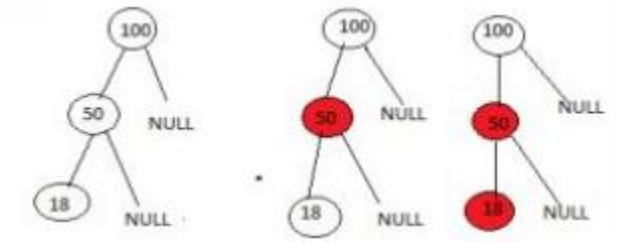
D. Branch

Answer: B. Leaf

65. Why do we impose restrictions like
. root property is black
. every leaf is black
. children of red node are black
. all leaves have same black
a) to get logarithm time complexity
b) to get linear time complexity
c) to get exponential time complexity
d) to get constant time complexity

Answer: a) to get logarithm time complexity

66. Cosider the below formations of red-black tree.



All the above formations are incorrect for it to be a redblack tree. then what may be the

correct order?
a) 50-black root, 18-red left subtree, 100-red right subtree
b) 50-red root, 18-red left subtree, 100-red right subtree
c) 50-black root, 18-black left subtree, 100-red right subtree
d) 50-black root, 18-red left subtree, 100-black right subtree

Answer: a) 50-black root, 18-red left subtree, 100-red right subtree

67. What are the operations that could be performed in O(logn) time complexity by red-black tree?
a) insertion, deletion, finding predecessor, successor
b) only insertion
c) only finding predecessor, successor
d) for sorting

Answer: a) insertion, deletion, finding predecessor, successor

68. When it would be optimal to prefer Red-black trees over AVL trees?
a) when there are more insertions or deletions
b) when more search is needed
c) when tree must be balanced
d) when log(nodes) time complexity is needed

Answer: a) when there are more insertions or deletions

69. Why Red-black trees are preferred over hash tables though hash tables have constant time complexity?
a) no they are not preferred
b) because of resizing issues of hash table and better ordering in redblack trees
c) because they can be implemented using trees
d) because they are balanced

Answer: b) because of resizing issues of hash table and better ordering in redblack trees

70. When to choose Red-Black tree, AVL tree and B-trees?

a) many inserts, many searches and when managing more items respectively
b) many searches, when managing more items respectively and many inserts respectively
c) sorting, sorting and retrieval respectively
d) retrieval, sorting and retrieval respectively

Answer: a) many inserts, many searches and when managing more items respectively

1. A connected graph T without any cycles is called .....

A. free graph

B. no cycle graph

C. non cycle graph

D. circular graph

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

A. isolated

B. complete

C. finite

D. strongly connected

3. A graph is said to be ..... if every node u in G is adjacent to every other node v in G.

A. Absolute

B. Entire

C. Inclusive

D. Complete

4. What will be the running-time of Dijkstra's single source shortest path algorithm, if the graph G(V,E) is stored in form of adjacency list and binary heap is used −

A - $O(|V|^2)$

B - O(|V| log |V|)

C - O(|E|+|V| log |V|)

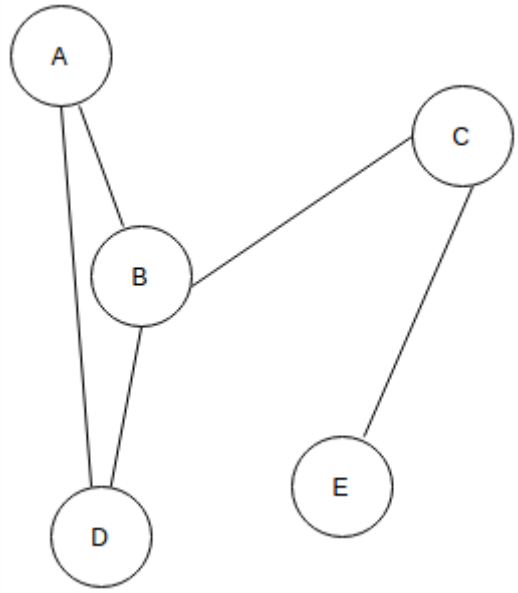
D - None of these

Answer : C

Explanation

The runing time will be O(|E|+|V| log |V|) when we use adjacency list and binary heap.

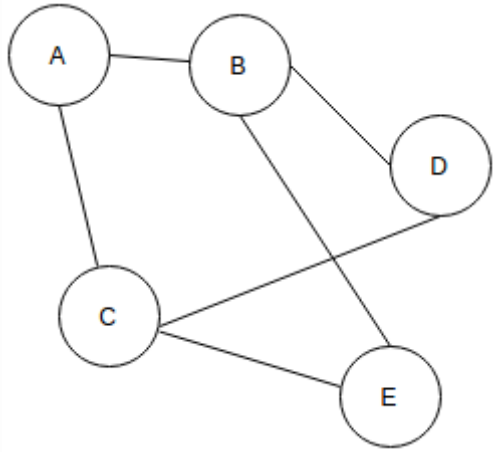
5. In the given graph identify the cut vertices.



a)B and E
b)C and D
c)A and E
d)C and B
View Answer

Answer:d
Explanation: After removing either B or C, the graph becomes disconnected.

6. For the given graph(G), which of the following statements is true?



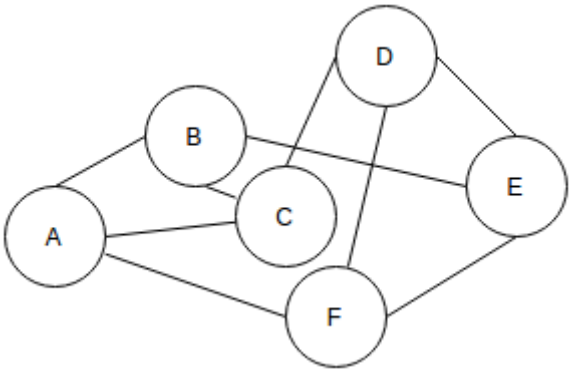
a) G is a complete graph
b) G is not a connected graph
c) The vertex connectivity of the graph is 2
d) The edge connectivity of the graph is 1
View Answer

Answer:c
Explanation : After removing vertices B and C, the graph becomes disconnected.

7. 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

Answer:b
Explanation: Number of ways in which every vertex can be connected to each other is nC2.

8. The given Graph is regular.



   a)True
   b)False
   View Answer

Answer:a
Explanation: In a regular graph, degrees of all the vertices are equal. In the given graph the degree of every vertex is 3.

9. The number of elements in the adjacency matrix of a graph having 7 vertices is _____
   a)7
   b)14
   c)36
   d)9
   View Answer

Answer:d
Explanation: There are n*n elements in the adjacency matrix of a graph with n vertices.

10. The time complexity to calculate the number of edges in a graph whose information in stored in form of an adjacency matrix is _____
    a)O(V)
    b)$O(E^2)$
    c)O(E)

d)O(V^2)

Answer:d
Explanation: As V entries are 0, a total of V^2-V entries are to be examined.

11. 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

Answer:b
Explanation: Row number of the matrix represents the tail, while Column number represents the head of the edge.

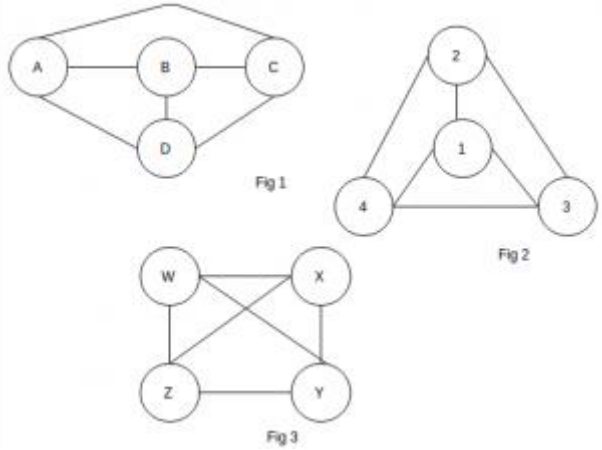
12. What is the maximum number of possible non zero values in an adjacency matrix of a simple graph with n vertices?
    a)(n*(n-1))/2
    b)(n*(n+1))/2
    c)n*(n-1)
    d)n*(n+1)
    View Answer

Answer:c
Explanation: Out of n*n possible values for a simple graph the diagonal values will always be zero.

13. Space complexity for an adjacency list of an undirected graph having large values of V (vertices) and E (edges) is _____
    a)O(E)
    b)O(V*V)
    c)O(E+V)
    d)O(V)

    Answer:c
    Explanation: In an adjacency list for every vertex there is a linked list which have the values of the edges to which it is connected.

14. Which of the following graphs are isomorphic to each other?



a)fig 1 and fig 2

b)fig 2 and fig 3

c)fig 1 and fig 3

d)fig 1, fig 2 and fig 3

Answer:d

Explanation: All three graphs are Complete graphs with 4 vertices.

15. Dijkstra's Algorithm will work for both negative and positive weights?

a)True

b)False

Answer:b

Explanation: Dijkstra's Algorithm assumes all weights to be non-negative.

16. What is the maximum possible number of edges in a directed graph with no self loops having vertices?

a)28

b)64

c)256

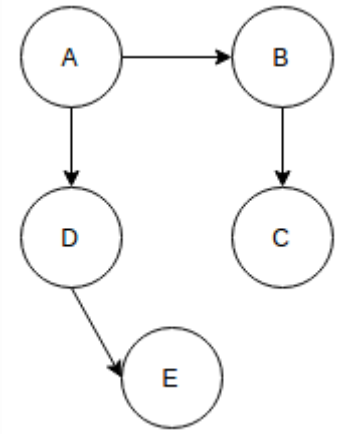
d)56

View Answer

Answer:d

Explanation: If a graph has V vertices than every vertex can be connected to a possible of V-1 vertices.

17. What would be the DFS traversal of the given Graph?



a)ABCED

b)AEDCB

c)EDCBA

d)ADECB

View Answer

Answer:a

Explanation: In this case two answers are possible including ADEBC.

18. The topological sorting of any DAG can be done in _____ time.

a)cubic

b)quadratic

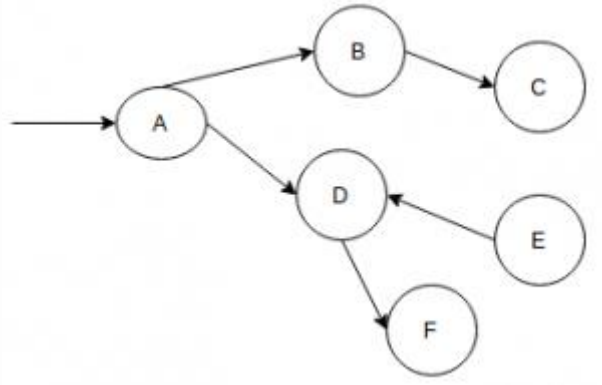
c)linear

d)logarithmic

Answer:c

Explanation: Topological sorting can be done in O(V+E), here V and E represents number of vertices and number of edges respectively.

19. 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

Answer:c
Explanation: In BFS nodes gets explored and then the neighbors of the current node gets explored, before moving on to the next levels.

20. 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

Answer:a
Explanation: In Depth First Search, we explore all the nodes aggressively to one path and then backtrack to the node. Hence, it is equivalent to the pre-order traversal of a Binary Tree.

21. Time Complexity of DFS is? (V – number of vertices, E – number of edges)

a)O(V + E)

b)O(V)

c)O(E)

d)None of the mentioned

Answer:a
Explanation: The Depth First Search explores every node once and every edge once (in worst case), so it's time complexity is O(V + E).

22. The Data structure used in standard implementation of Breadth First Search is?

a)Stack

b)Queue

c)Linked List

d)None of the mentioned

Answer:a
Explanation: The Depth First Search is implemented using recursion. So, stack can be used as data structure to implement depth first search.

23. 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)None of the mentioned

Answer:a
Explanation: This is the definition of the Depth First Search. Exploring a node, then aggressively finding nodes till it is not able to find any node.

24. 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)None of the mentioned

Answer:c
Explanation: In Depth First Search, we have to see whether the node is visited or not by it's ancestor. If it is visited, we won't let it enter it in the stack.

25. 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

Answer:c
Explanation: The Breadth First Search Algorithm searches the nodes on the basis of level. It takes a node (level 0), explores it's neighbors (level 1) and so on.

26. Time Complexity of Breadth First Search is? (V – number of vertices, E – number of edges)
a)O(V + E)
b)O(V)
c)O(E)
d)None of the mentioned

Answer:a
Explanation: The Breadth First Search explores every node once and every edge once (in worst case), so it's time complexity is O(V + E).

27. The Data structure used in standard implementation of Breadth First Search is?
a)Stack
b)Queue
c)Linked List
d)None of the mentioned

Answer:b
Explanation: The Breadth First Search explores every node once and put that node in queue and then it takes out nodes from the queue and explores it's neighbors.

28. What can be the applications of Breadth First Search?
a) Finding shortest path between two nodes

b) Finding bipartiteness of a graph

c) GPS navigation system

d) All of the mentioned

Answer: d

Explanation: Breadth First Search can be applied to all of the mentioned problems. Bipartiteness of a graph means that a graph can be divided into two disjoint sets such that every edge connects a vertex in to one in.

29. Regarding implementation of Breadth First Search using queues, what is the maximum distance between two nodes present in the queue? (considering each edge length 1)

a)Can be anything

b)0

c)At most 1

d)Insufficient Information

Answer:c

Explanation: In the queue, at a time, only those nodes will be there whose difference among levels is 1. Same as level order traversal of the tree.

30. Rather than build a subgraph one edge at a time ..... builds a tree one vertex at a time.

A) kruskal's algorithm

B) prim's algorithm

C) dijkstra algorithm

D) bellman ford algorithm

31. The result of prim's algorithm is a total time bound of .....

A) O(logn)

B) O(m+n logn)

C) O(mn)

D) O(m logn)

32. What is a hash table?

a) A structure that maps values to keys

b) A structure that maps keys to values

c) A structure used for storage

d) A structure used to implement stack and queue

Answer:b

Explanation: A hash table is used to implement associative arrays which has a key-value pair, so the has table maps keys to values.

33. If several elements are competing for the same bucket in the hash table, what is it called?

a)Diffusion

b)Replication

c)Collision

d)None of the mentioned

Answer: c

34. What is direct addressing?

a)Distinct array position for every possible key

b)Fewer array positions than keys

c)Fewer keys than array positions

d)None of the mentioned

Answer:a
Explanation: Direct addressing is possible only when we can afford to allocate an array that has one position for every possible key.

35. What is the search complexity in direct addressing?

a)O(n)

b)O(logn)

c)O(nlogn)

d)O(1)

Answer:d
Explanation: Since every key has a unique array position, searching takes a constant time

36. What is a hash function?

a) A function has allocated memory to keys

b) A function that computes the location of the key in the array

c) A function that creates an array

d) None of the mentioned

Answer:b
Explanation: In a hash table, there are fewer array positions than the keys, so the position of the key in the array has to be computed, this is done using the hash function.

37. In simple chaining, what data structure is appropriate?

a)Singly linked list

b)Doubly linked list

c)Circular linked list

d)Binary trees

View Answer
Answer:b
Explanation: Deletion becomes easier with doubly linked list, hence it is appropriate.

A hash function f defined as f (key) = key mod 13, with linear probing is used to insert keys 55, 58, 68, 91, 27, 145. What will be the location of 79 ?

A.	1
B.	2
C.	3
D.	5
View/Hide Ans	**Correct Answer is D**

38. Key value pairs is usually seen in
    A. Hash tables
    B. Heaps
    C. Both a and b
    D. Skip list
    Answer : a