Hall Ticket No:

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

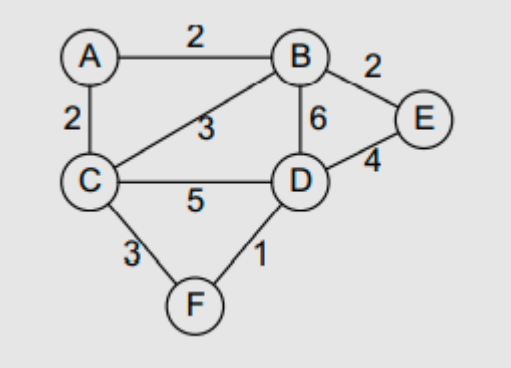
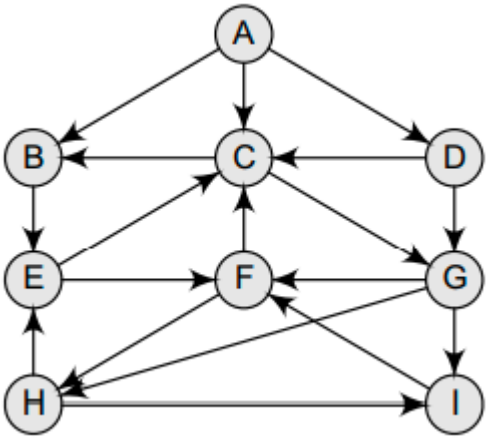
II B.Tech I Semester (MR20-2021-22 Batch) Mid Term Examinations-II, February-2022

Branch: **Computer Science and Engineering** Time: **90 Mins** Date:

Subject Code & Name: A0509-**DATA STRUCTURES**

Answer ALL the Questions

S NO.	Questions	Marks	BT Level	CO
	Module-3			
1	Design an AVL tree using the following sequence of data: 63, 9, 19, 27, 18, 108, 99, 81.	5	L6	3
2	Illustrate the properties of a red-black tree with an example	5	L4	3
3	Explain splay trees in detail with relevant examples.	5	L3	3
4	Explain about AVL tree and its operations with different rotations.	5	L3	3

S NO.	Questions	Marks	BT Level	CO
	Module-4			
1	Differentiate between depth-first search and breadth-first search traversal of a graph	5	L4	4
2	Implement the graph representation methods in the memory by consider the graph given below 	5	L3	4
3	Explain the procedure of Depth First Search traversal technique with an example.	5	L3	4
4	Implement the Breadth First Search traversal method on below given graph 	5	L4	4
5	Construct the following sequence of numbers in descending order using heap sort. 42, 34, 75, 23, 21, 18, 90, 67, 78	5	L5	4
6	Implement a sort technique on following elements 77, 49, 25, 12, 9, 33, 56, 81 that works on the principle of divide and conquer strategy	5	L4	4

7	Design a binary max-heap and a min-heap from the following sequence of data: 50, 40, 35, 25, 20, 27, 33.	5	L6	4
8	Explain about merge sort and sort the given elements 39,9,81,45,90,27,72,18	5	L3	4
S NO.	**Questions**	**Marks**	**BT Level**	**CO**
	Module-5			
1	Which pattern matching algorithm scans the characters from right to left? Explain it with suitable example.	5	L3	5
2	Explain the applications of pattern matching algorithm?	5	L3	5
3	Demonstrate working principal of Knuth Morris Pratt algorithm with example.	5	L3	5
4	Give a brief description on pattern matching problem and explain Boyer-moor algorithm with an example.	5	L3	5
5	What is a binary trie? Construct a binary trie with elements: 0001, 0011, 1000, 1001, 1100, 0010, 1101, 1010	5	L5	5
6	Explain the advantages and disadvantages of tries	5	L4	5
7	What is the importance of Binary tries and Discuss its applications	5	L3	5
8	Explain the following: 1) Standard Tries 2) Compressed Tries 3)Suffix tries	5	L4	5

Prepared By Name:
Signature: **HOD Signature**

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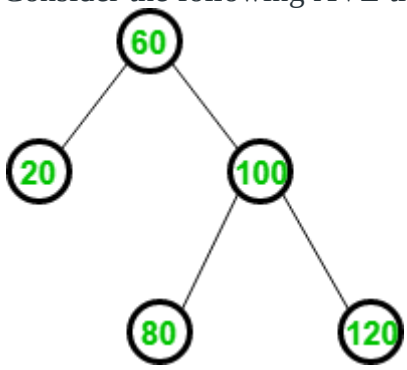
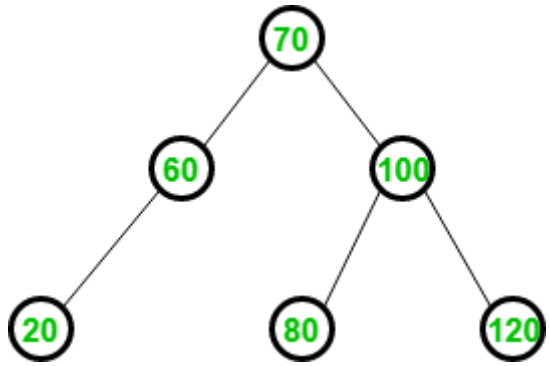
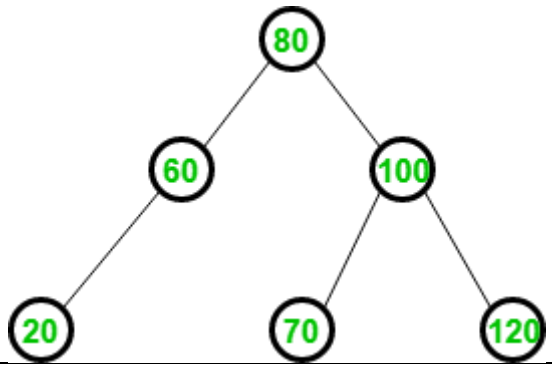
MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

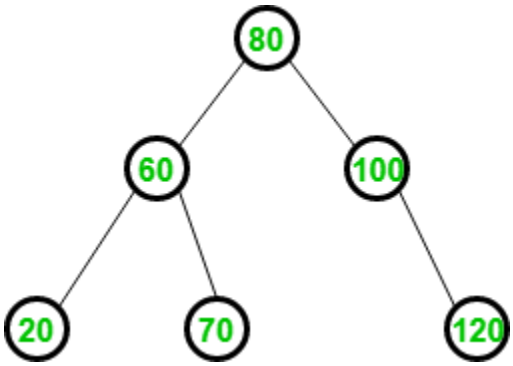
II B.Tech I Semester (MR20-2020-21 Batch) Mid Term Examinations-I, February-2022

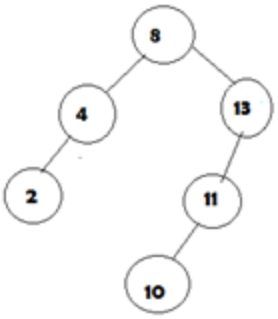
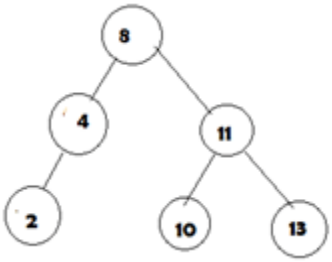
Subject Code & Name: A0509-**DATA STRUCTURES** Max. Marks: **25M**

Branch: **Computer Science and Engineering** Time: **90 Mins** Date:

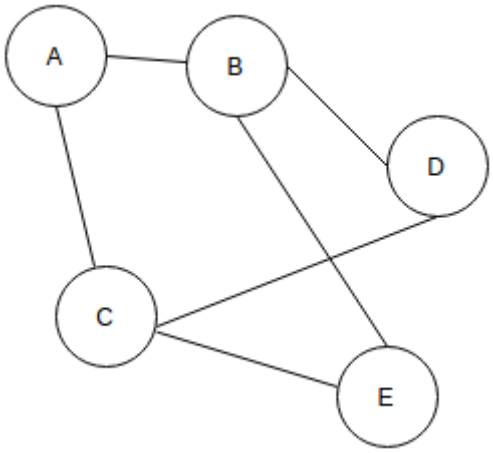
Answer ALL the Questions:

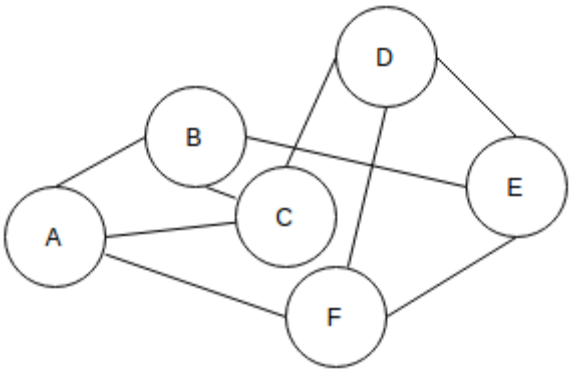
S. NO.	Questions	Ans
	Model-3	
1	What is the maximum height of any AVL-tree with 7 nodes? Assume that the height of a tree with a single node is 0. (A) 2 (B) 3 (C) 4 (D) 5	
2	Consider the following AVL tree.  Which of the following is updated AVL tree after insertion of 70? (A)  (B)  	

	(C)  `D) None	
3	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	
4	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	
5	What is the maximum height of an AVL tree with p nodes? a) p b) log(p) c) log(p)/2 d) $^{p}/_{2}$	
6	To restore the AVL property after inserting a element, we start at the insertion point and move towards root of that tree. is this statement true? a) true b) false	
7	What maximum difference in heights between the leafs of a AVL tree is possible? a) log(n) where n is the number of nodes b) n where n is the number of nodes c) 0 or 1 d) atmost 1	
8	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	
9	Which of the below diagram is following AVL tree property?	

	i.  ii.  a) only i b) only i and ii c) only ii d) i is not a binary search tree	
10	Which of the following property of splay tree is correct? a) it holds probability usage of the respective sub trees b) any sequence of j operations starting from an empty tree with h nodes atmost, takes O(jlogh) time complexity c) sequence of operations with h nodes can take O(logh) time complexity d) splay trees are unstable trees	
11	What are splay trees? a) self adjusting binary search trees b) self adjusting binary trees c) a tree with strings d) a tree with probability distributions	
12	Which of the following is an application of Red-black trees and why? a) used to store strings efficiently b) used to store integers efficiently c) can be used in process schedulers, maps, sets d) for efficient sorting	
13	What is the special property of red-black trees and what root should always be? a) a color which is either red or black and root should always be black color only b) height of the tree c) pointer to next node d) a color which is either green or black	
14	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	
15	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	
16	Descending priority queue can be implemented using _____ a) max heap b) min heap c) min-max heap d) trie	
17	Min heap can be used to implement selection sort. a) True b) False	
18	The ascending heap property is _____ a) A[Parent(i)] =A[i] b) A[Parent(i)] <= A[i] c) A[Parent(i)] >= A[i] d) A[Parent(i)] > 2 * A[i]	
19	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	
20	The procedure FindMin() to find the minimum element and the procedure DeleteMin() to delete the minimum element in min heap take _____ a) logarithmic and linear time constant respectively b) constant and linear time respectively c) constant and quadratic time respectively d) constant and logarithmic time respectively	
21	In a binary min heap containing n elements, the largest element can be found in _____ time. a) O(n) b) O(nlogn) c) O(logn) d) O(1)	
22	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	
23	On which algorithm is heap sort based on? a) Fibonacci heap b) Binary tree c) Priority queue	

	d) FIFO	
24	In what time can a binary heap be built? a) O(N) b) O(N log N) c) O(log N) d) $O(N^2)$	
25	In what position does the array for heap sort contains data? a) 0 b) 1 c) -1 d) anywhere in the array	
	Module-4	
01	What is the typical running time of a heap sort algorithm? a) O(N) b) O(N log N) c) O(log N) d) $O(N^2)$	
02	What is the time taken to perform a delete min operation? a) O(N) b) O(N log N) c) O(log N) d) $O(N^2)$	
03	Which of the following statements for a simple graph is correct? a) Every path is a trail b) Every trail is a path c) Every trail is a path as well as every path is a trail d) Path and trail have no relation	
04	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	
05	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	
06	A connected planar graph having 6 vertices, 7 edges contains _____ regions. a) 15 b) 3 c) 1 d) 11	
07	The given Graph is regular.  a) True b) False	
08	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	
09	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	
10	The Breadth First Search traversal of a graph will result into? a) Linked List b) Tree c) Graph with back edges d) Arrays	
11	The Data structure used in standard implementation of Breadth First Search is? a) Stack b) Queue c) Linked List d) Tree	

12	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) O(V*E)	
13	A graph with all vertices having equal degree is known as a _____ a) Multi Graph b) Regular Graph c) Simple Graph d) Complete Graph	
14	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	
15	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	
16	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	
17	When the Breadth First Search of a graph is unique? a) When the graph is a Binary Tree b) When the graph is a Linked List c) When the graph is a n-ary Tree d) When the graph is a Ternary Tree	
18	Which of the following sorting algorithm does not use recursion? a) quick sort b) merge sort c) heap sort d) bottom up merge sort	
19	What will be the best case time complexity of merge sort? a) O(n log n) b) $O(n^2)$ c) $O(n^2 \log n)$ d) $O(n \log n^2)$	
20	Which of the following method is used for sorting in merge sort? a) merging b) partitioning c) selection d) exchanging	
21	What is the worst case time complexity of merge sort?	

	a) O(n log n) b) O(n^2) c) O(n^2 log n) d) O(n log n^2)	
22	What is the auxiliary space complexity of merge sort? a) O(1) b) O(log n) c) O(n) d) O(n log n)	
23	What is the average case time complexity of merge sort? a) O(n log n) b) O(n^2) c) O(n^2 log n) d) O(n log n^2)	
24	In BFS, how many times a node is visited? a) Once b) Twice c) Equivalent to number of indegree of the node d) Thrice	
25	Merge sort uses which of the following technique to implement sorting? a) backtracking b) greedy algorithm c) divide and conquer d) dynamic programming	
26	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’	
27	In heap sort, after deleting the last minimum element, the array will contain elements in? a) increasing sorting order b) decreasing sorting order c) tree inorder d) tree preorder	
28	Regarding implementation of Depth First Search using stacks, what is the maximum distance between two nodes present in the stack? (considering each edge length 1) a) Can be anything b) 0 c) At most 1 d) Insufficient Information	
29	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	
30	Which of the following is not an application of Depth First Search? a) For generating topological sort of a graph b) For generating Strongly Connected Components of a directed graph c) Detecting cycles in the graph	

	d) Peer to Peer Networks	
31	When the Depth First Search of a graph is unique? a) When the graph is a Binary Tree b) When the graph is a Linked List c) When the graph is a n-ary Tree d) When the graph is a ternary Tree	
32	For which of the following combinations of the degrees of vertices would the connected graph be eulerian? a) 1,2,3 b) 2,3,4 c) 2,4,5 d) 1,3,5	
33	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	
34	Time Complexity of DFS is? (V – number of vertices, E – number of edges) a) O(V + E) b) O(V) c) O(E) d) O(V*E)	
35	The Depth First Search traversal of a graph will result into? a) Linked List b) Tree c) Graph with back edges d) Array	
36	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	
37	Which of the following is true? a) A graph may contain no edges and many vertices b) A graph may contain many edges and no vertices c) A graph may contain no edges and no vertices d) A graph may contain no vertices and many edges	
38	. If a simple graph G, contains n vertices and m edges, the number of edges in the Graph G'(Complement of G) is _____ a) (n*n-n-2*m)/2 b) (n*n+n+2*m)/2 c) (n*n-n-2*m)/2 d) (n*n-n+2*m)/2	
39	. In a simple graph, the number of edges is equal to twice the sum of the degrees of the vertices. a) True b) False	

40	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	
41	Which of the following is not a variant of merge sort? a) in-place merge sort b) bottom up merge sort c) top down merge sort d) linear merge sort	
42	Merge sort is preferred for arrays over linked lists. a) true b) false	
43	Which of the following stable sorting algorithm takes the least time when applied to an almost sorted array? a) Quick sort b) Insertion sort c) Selection sort d) Merge sort	
44	Which of the following is an external sorting? A. Insertion Sort B. Bubble Sort C. Merge Sort D. Tree Sort	
45	Which of the following sorting algorithm is of divide and conquer type? a). Bubble sort b). Insertion sort c) Quicksort d). Merge sort	
46	The time complexity of heap sort is …. a) O(n) b) O(logn) c) O(n2) d) O(n logn)	
47	. ……. sorting is good to use when alphabetizing a large list of names. a). Merge b). Heap c). Radix d). Bubble	
48	A tree sort is also known as …… sort. a). quick b). shell c) heap d). selection	
49	Trie is also known as _____ a) Digital Tree b) Treap c) Binomial Tree d) 2-3 Tree	

	Module-5	
01	What traversal over trie gives the lexicographical sorting of the set of the strings? a) postorder b) preorders c) inorder d) level order	
02	Which of the following is the efficient data structure for searching words in dictionaries? a) BST b) Linked List c) Balancded BST d) Trie	
03	. Which of the following special type of trie is used for fast searching of the full texts? a) Ctrie b) Hash tree c) Suffix tree d) T tree	
04	Which of the following is not true? a) Trie requires less storage space than hashing b) Trie allows listing of all the words with same prefix c) Tries are collision free d) Trie is also known as prefix tree	
05	program to search a contact from phone directory can be implemented efficiently using _____ a) a BST b) a trie c) a balanced BST d) a binary tree	
06	What can be the maximum depth of the trie with n strings and m as the maximum sting the length? a) log2n b) log2m c) n d) m	
07	Which of the following is true about the trie? a) root is letter a b) path from root to the leat yields the string c) children of nodes are randomly ordered d) each node stores the associated keys	
08	Auto complete and spell checkers can be implemented efficiently using the trie. a) True b) False	
09	____ refers to the set of all possible solutions to a problem a) Search Space b) Brute Force	
10	Brute force search commonly known as ____ a)Naïve Algorithm b) Uninformed Algorithm c) Both a and b	

	d) Search Algorithm	
11	What is the time complexity of the bruteforce algorithm used to find the length of the longest palindromic subsequence? a)O(1) b) O(2^n) c)O(n) d) O(n^2)	
12	Which of the following is the fastest algorithm in string matching field? a) Boyer-Moore's algorithm b) String matching algorithm c) Quick search algorithm d) Linear search algorithm	
13	Which of the following algorithms formed the basis for the Quick search algorithm? a) Boyer-Moore's algorithm b) Parallel string matching algorithm c) Binary Search algorithm d) Linear Search algorithm	
14	What is the space complexity of quick search algorithm? a) O(n) b) O(log n) c) O(m+n) d) O(mn)	
15	What character shift tables does Boyer-Moore's search algorithm use? a) good-character shift tables b) bad-character shift tables c) next-character shift tables d) both good and bad character shift tables	
16	What is the worst case running time in searching phase of Boyer-Moore's algorithm? a) O(n) b) O(log n) c) O(m+n) d) O(mn) 18. Given input string = "ABCDABCATRYCARCABCSRT" and pattern string = "CAT". Find the first index of the pattern match using quick search algorithm. a) 2 b) 6 c) 11 d) 14	
17	_____ is the process of recognizing patterns by using machine learning algorithm. a) Processed Data b) Literate Statistical Programming c) Pattern Recognition d) Likelihood	
18	Which of the following algorithms are used for string and pattern matching problems? a) Z Algorithm	

	b) Rabin Karp Algorithm c) KMP Algorithm d) All of the above	
19	Can suffix tree be used in bioinformatics problems and solutions. a). True **b).** False	
20	Which of the following is true about the trie? **a)** Root is letter a **b)** Path from root to the leat yields the string C) Children of nodes are randomly ordered **d)** Each node stores the associated keys	
21	How much time does construction of suffix tree take? a) O (log M) b) O (M!) c) Exponential to Length of Tree d) Linear to Length of Tree	
22	What is the worst case running time of Rabin Karp Algorithm? a) Theta(n) b) Theta(n-m) c). Theta((n-m+1)m) d) Theta(nlogm)	
23	What is the running time of Boyer-Moore's algorithm? a) O(n) b) O(log n) c) O(m+n) d) O(mn)	
24	What is the auxiliary space complexity of Z algorithm for pattern searching (m = length of text, n = length of pattern)? a) O(n + m) **b) O(m)** c) O(n) d) O(m * n)	
25	Which of the following is a sub string of "SANFOUNDRY"? a) SANO **b) FOUND** c) SAND d) FOND	
26	Which of the following algorithm of data compression uses a suffix tree? a) Weiner's algorithm b) Farach's algorithm c) Lempel – Ziv – Welch's algorithm d) Alexander Morse's algorithm	
27	What is a time complexity for finding the total length of all string on all edges of a tree? a) Θ (n) b) Θ (n!) c) Θ (1) d) O (n^2)	

28	Which of the following methods can be used to solve the Knapsack problem? a) Brute force algorithm b) Recursion c) Dynamic programming d) Brute force, Recursion and Dynamic Programming	
29	What is the time complexity of the brute force algorithm used to solve the Knapsack problem? a) O(n) b) O(n!) c) $O(2^n)$ d) $O(n^3)$	
30	The 0-1 Knapsack problem can be solved using Greedy algorithm. a) True b) False	
31	A _____ is an advanced data structure that is sometimes also known as prefix tree a) Stack b) Queue c) Trie d) All of the above	
32	What is the benefit of compressed binary trie over normal binary tree? a) Much faster compared to regular trie tree b) Huge memory advantage c) No string operations d) All of the above	
33	A trie is used to store strings a) True b) False	
34	In the worst case, a root-node to element-node path has a branch node for every digit in a key. Therefore, the height of a trie is a) At most number of digits + 1 . b) At most number of digits + 2n. c) At most number of digits + 0. d) Non of the above	
35	Like other search-oriented data structures, a trie stores keys and associated values. Together, the key and value are called an entry. The key is always a ---------- a) Number b) String c) Special character d) None of the above	
36	Knuth Morris Pratt (KMP) is an algorithm, which checks the characters from ------ **a**) Right to Left b) Left to Right c) Top to Bottom d) Bottom to Top	
37	In real world KMP algorithm is used in those applications where pattern matching is done in ___ a) Short strings b) Long Strings c) One character	

	d) None of the above	
38	Which strategy is used in KMP string matching algorithm? a) Transitive property b) Regenerating property c) Degenerating property d) All of the above	
39	A ____ is a tree where the edges, namely the lines connections the nodes, are labeled with the letters of our suffixes. a) Suffix trie b) Standard trie c) Compressed Trie d) None of the above	
40	How many nodes does the suffix trie have? a) No Limit b) At most 2n + 1 nodes c) At most 2n − 1 nodes d) b) At most 2n+2 nodes	
41	Which algorithm is best for pattern matching? a) The Boyer-Moore-Horspool algorithm b) Brute Force Algorithm c) KMP algorithm d) None of the above	
42	which one is not a pattern matching algorithm. a) Naïve string-search algorithm b) Rabin–Karp algorithm c) Knuth–Morris–Pratt algorithm d) z Algorithm	
43	___ is a tree like data structured used to store collection of Strings a) Stack b) Queue c) Array d) Trie	
44	_____ the first **linear time complexity** algorithm for string matching. a) KMP Algorithm b) Z Algorithm c) Naïve String search algorithm d) None of the Above.	
45	KMP algorithm is used to find a **"Pattern"** in **a "Text".** This algorithm compares character by character from left to right. But whenever a mismatch occurs, it uses a preprocessed table called_____ a) Postfix Table b) Infix Table c) Prefix Table d) Hash table	
46	The best case time complexity of the Boyer-Moore Algorithm is: a)Theta(n) **b)** Theta(n-m) **c)** Theta((n-m+1)m) **4.** None of the above	
47	A _____ Trie is an advanced version of the standard trie. Each nodes(except the leaf nodes) have atleast 2 children.	

	a) Standard trie b) Compressed trie c) Sufixtrie d) All of the above	
48	. What is a time complexity for finding all the maximal palindrome in a string? a) Θ (n) b) Θ (n!) c) Θ (1) d) O (log n!)	
49	Finding the location of a given item in a collection of items is called …… A. Discovering B. Finding C. Searching D. Mining	
50	Very slow way of sorting is ……. A. Insertion sort B. Heap sort C. Bubble sort D. Quick sort	