



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

TUTORIAL QUESTION BANK

Course Name	:	DATA STRUCTURES
Course Code	:	A30502
Class	:	II B. Tech I Semester
Branch	:	IT
Year	:	2016 – 2017
Course Coordinator	:	Mr. Ch. Suresh Kumar Raju, Associate Professor
Course Faculty	:	Mr. Ch. Suresh Kumar Raju, Associate Professor

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

S No	QUESTION	Blooms taxonomy level	Course Outcomes
UNIT - I			
Part - A (Short Answer Questions)			
1	Define the term algorithm and state the criteria the algorithm should satisfy.	Remember	5
2	Define recursive algorithm	Remember	2
3	Differentiate between recursive and iterative algorithms	Remember	2
4	Define asymptotic notations: big 'Oh', omega and theta?	Remember	5
5	Describe best case, average case and worst case efficiency of an algorithm?	Remember	5
6	How do you measure the algorithm running time?	Understand	5
7	Describe the role of space complexity and time complexity in measuring the performance of a program.	Understand	5
8	Define the term Data abstraction.	Remember	6
9	Define data structure .	Remember	3
10	List linear and nonlinear data structures.	Remember	3
11	List the operations performed in the Linear Data Structure.	Remember	3

12	List out any four applications of data structures?	Understand	4
13	Define Linked List.	Remember	6
14	State the different types of linked lists.	Remember	6
15	List the basic operations carried out in a linked list.	Remember	6
16	List the advantages and disadvantages of linked list.	Remember	6
17	Define Sparse Matrix and its Representation with example.	Remember	6
18	Define Doubly Linked List.	Remember	6
19	List areas where data structures can be applied.	Remember	6
20	Define Circular Linked List.	Remember	6
Part - B (Long Answer Questions)			
1	Discuss various the asymptotic notations used for best case average case and worst case analysis of algorithms.	Understand	5
2	Explain Performance Analysis in Detail.	Understand	5
3	Define recursion. Explain with it Fibonacci series and factorial of a number.	Apply	5
4	Explain time and space complexities in detail	Understand	5
5	Explain the different operations on singly linked list	Remember	6
6	Explain concatenation of singly linked lists	Apply	6
7	Explain circular linked list operations	Remember	6
8	Explain doubly linked list operations	Remember	6
9	List the advantages and disadvantages of doubly linked list over singly linked list?	Understand	6
10	Explain the applications of doubly linked lists	Understand	6
11	Explain the following operations in a doubly linked list. (i) Insert an element (ii) Delete an element (iii) Reverse the list	Remember	6
12	Write an algorithm to insert and delete a key in a circular queue	Remember	6
13	Explain Array and Linked representation of Sparse Matrix	Understand	6
14	Write a program to insert an element in between two nodes in a double linked list	Apply	6
15	Explain how to create circular linked list and insert nodes at end	Apply	6
Part - C (Problem Solving and Critical Thinking Questions)			
1	$F(n)=3n^2-n+4$ show that $f(n)=O(n^2)$	Apply	5
2	$F(n)=5n^2+10n$ convert this to $\Omega()$ notation	Apply	5
3	$F(n)=\sqrt{n}$ and $g(n)=\log n$, show that $f(n)+g(n)=O(\sqrt{n})$	Apply	5
4	List out few of the applications that make use of Multilinked Structures?	Understand	2
5	Write a C program that uses functions to perform the following: a) Create a singly linked list of integers. b) Delete a given integer from the above linked list. c) Display the contents of the above list after deletion.	Apply	7
6	Write a C program that uses functions to perform the following: a) Create a doubly linked list of integers. b) Delete a given integer from the above doubly linked list. c) Display the contents of the above list after deletion.	Apply	7

7	Given a Singly linked list with each node containing either 0, 1 or 2. Write code to sort the list. Input: 1 -> 1 -> 2 -> 0 -> 2 -> 0 -> 1 -> 0 Output: 0 -> 0 -> 0 -> 1 -> 1 -> 1 -> 2 -> 2	Apply	7
8	Given a linked list and two integers M and N. Traverse the linked list such that you retain M nodes then delete next N nodes, continue the same until end of the linked list. Input: M = 2, N = 2 Linked List: 1->2->3->4->5->6->7->8 Output: Linked List: 1->2->5->6 The main part of the problem is ...	Apply	7
9	Given two linked lists in a way such that the resultant must contain the elements alternatively from one list to other list. Input : LL1:1→2→3→4 LL2: 5→ 6→7 Output: 1→5→2→6→3→7→4	Apply	7
10	Write a program to remove duplicate vales from a double linked list	Apply	7

UNIT - II

Part – A (Short Answer Questions)

1	Define Stack.	Remember	1
2	List the applications of stack	Remember	6
3	Define Queue.	Remember	6
4	List the applications of queue	Remember	6
5	Differentiate Stack and Queue	Understand	6
6	List out the basic operations that can be performed on a stack and queue	Remember	6
7	List the different types of queues	Remember	6
8	Define Circular Queue	Remember	6
9	List the operations that can be performed on Circular Queue	Remember	6
10	Define Circular Queue full condition	Remember	6
11	Define DEQUEUE	Remember	6
12	List the operations that can be performed on DEQUEUE	Remember	6
13	State the different ways of representing expressions	Remember	6
14	State the rules to be followed during infix to postfix conversions	Remember	4
15	Convert the infix expression (a+b)-(c*d) into post fix form	Apply	4
16	List how Stacks and Queues are represented in data structure	Understand	6
17	Discuss which data structure used in recursion	understand	6
18	Explain the difference between stack implementation using array and linked list	Understand	6
19	Write the necessity of infix to post fix conversion	Understand	4
20	Write the Dequeue empty condition	Remember	6

Part - B (Long Answer Questions)

1	Write an algorithm for basic operations on Stack	Remember	1
2	Explain the procedure to evaluate postfix expression	Remember	4
3	Evaluate the following postfix expression: 6 2 3 + - 3 8 2 / + * 2 3 +	Apply	4
4	Explain the procedure to convert infix expression into postfix expression	Remember	4

5	Convert the following expression $A + (B * C) - ((D * E + F) / G)$ into post form.	Apply	4
6	Explain the operations on simple Queue	Remember	6
7	Write an algorithm for basic operations on circular queue	Remember	6
8	Explain DEQUEUE ADT and its operations	Remember	6
9	Implement a queue using two stacks.	Apply	6
10	Implement a Circular queue of integer of user specified size and write the functions for initialize() enqueue() and dequeue()	Understand	6

Part – C (Problem Solving and Critical Thinking)

1	Convert the expression $((A + B) * C - (D - E) ^ (F + G))$ into equivalent Postfix notation.	Apply	1
2	Transform the following expression to postfix expression using stacks. $(a+b)*((d-e)+f)$	Apply	1
3	Convert infix expression into its equivalent post fix expression $A*(B+D)/E-F*(G+H/K)$	Apply	1
4	Transform the following expression to postfix expression using stacks. $(A+B)*(C*(D-E)+F)-G$	Apply	1
5	Write a C program that uses stack operations to convert a given infix expression into its postfix Equivalent.	Apply	1
6	Evaluate the postfix expression $6\ 2\ 3\ +\ -\ 3\ 8\ 2\ /\ +\ * \ 2\ \$\ 3\ +$	Apply	1
7	Evaluate the postfix expression $1\ 2\ +\ 3\ * \ 6\ +\ 2\ 3\ +\ /$	Apply	1
8	Evaluate the postfix expression $10\ 2\ 8\ * \ +\ 3\ -\ 1\ 2\ 3\ * \ +\ -$	Apply	1
9	Write C programs to implement stack ADT using Arrays	Apply	7
10	Write C programs to implement stack ADT using Linked List	Apply	7
11	Write C programs to implement queue ADT using Arrays	Apply	7
12	Write C programs to implement queue ADT using Linked List	Apply	7
13	Write an algorithm for basic operations on simple queue	Apply	7
14	Write C programs to implement a double ended queue ADT using arrays	Apply	7
15	Write C programs to implement a double ended queue ADT using doubly linked list	Apply	7

UNIT-III

Part - A (Short Answer Questions)

1	Define Tree.	Remember	6
2	List the applications of Trees	Understand	6
3	Define the terms node, degree, siblings, depth/height, level	Remember	6
4	Define path in a tree	Remember	6
5	Define Binary Tree	Remember	6
6	Define full binary tree	Remember	6
7	Define complete binary tree	Remember	6
8	Define a right-skewed binary tree and Left-skewed binary tree.	Remember	6
9	State the properties of a Binary Tree.	Remember	6
10	Discuss how to represent Binary Tree	Remember	6

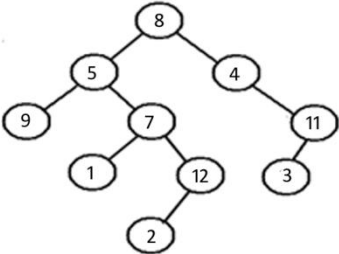
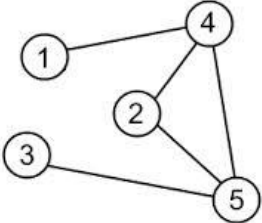
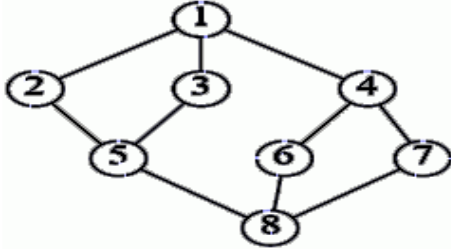
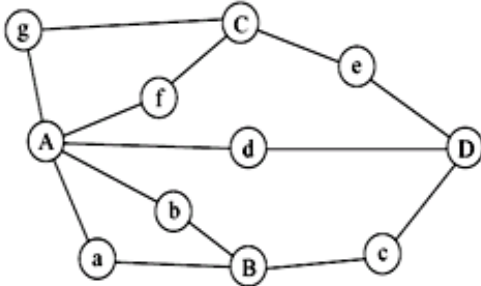
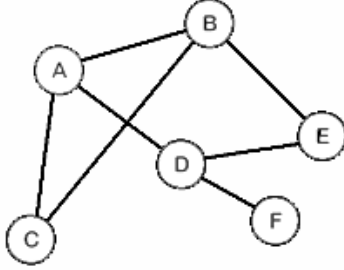
11	List the different tree traversals	Remember	10
12	Discuss threaded binary tree	Remember	6
13	Define heap	Remember	6
14	Define Priority Queue	Remember	6
15	Differentiate Max-heap and Min-heap	Understand	6
16	Define graph	Remember	6
17	Discuss representation of graph with examples	Understand	10
18	List the different graph traversals	Remember	10
19	Differentiate BFS and DFS	Understand	10
20	Differentiate max priority queue and min priority queue	Understand	6

Part – B (Long Answer Questions)

1	Explain Binary tree ADT	Remember	6
2	Discuss representation of binary tree	Remember	6
3	Explain tree traversals with example	Understand	10
4	Discuss max priority queue ADT with examples	Remember	6
5	List the advantages of priority queue? Explain the implementation of Priority Queue.?	Understand	6
6	Define threaded binary tree? Explain the impact of such a representation on the tree traversal procedure?	Understand	6
7	Explain graph ADT	Remember	10
8	Explain different ways representation of graphs	Remember	6
9	Explain BFS graphs traversal algorithms with suitable example	Understand	10
10	Explain DFS graphs traversal algorithms with suitable example	Understand	10
11	Differentiate BFS and DFS	Understand	6
12	Explain with an example how to insert an element to maxheap	Understand	6
13	Explain with an example how to delete an element from maxheap	Understand	6
14	Define Graph and explain how graphs can be represented in adjacency matrix and adjacency list	Understand	6
15	Write the advantages of using BFS over DFS or using DFS over BFS? What are the applications and downsides of each?	Understand	10

Part – C (Problem Solving and Critical Thinking)

1	<p>Write inorder, preorder, post order traversal of the following tree</p> <pre> graph TD 2((2)) --> 7((7)) 2 --> 5((5)) 7 --> 2((2)) 7 --> 6((6)) 6 --> 5((5)) 6 --> 11((11)) 5 --> 9((9)) 9 --> 4((4)) </pre>	Apply	10
---	---	-------	----

2	<p>Write inorder, preorder, post order traversal of the following tree</p> 	Apply	10
3	<p>Illustrate BFS and DFS traversals of following graph</p> 	Apply	10
4	<p>Illustrate DFS traversal of following graph</p> 	Apply	10
5	<p>Illustrate DFS and BFS traversals of following graph</p> 	Apply	10
6	<p>Illustrate BFS and DFS traversals of following graph</p> 	Apply	10
7	<p>Given In order traversal of a binary tree is D,G,B,E,A,H,F,I,C and pre order traversal is A,B,D,G,E,C,F,H,I construct binary tree</p>	Apply	6
8	<p>Given In order traversal of a binary tree is E,A,C,K,F,H,D,B,G and pre order traversal is F,A,E,K,C,D,H,G,B find the post order traversal</p>	Apply	6

9	Given a queue of elements with priorities: 21, 13,17,10,7,11 do the following: a)Build the binary heap (draw the tree at each step) and show the corresponding array b)Delete the element with the highest priority, drawing the tree at each step of the deleting procedure c)Insert a new element with priority 15 and draw the tree at each step of the insertion procedure	Apply	6
10	Construct max heap for 150, 80, 40,30,10, 70, 110, 100, 20, 90, 60, 50,120,140,130	Apply	6
UNIT-IV			
Part – A (Short Answer Questions)			
1	Differentiate Linear search and binary search	Understand	8
2	Define Hashing	Remember	9
3	Explain Hash Function	Remember	9
4	List different types of popular hash functions	Remember	9
5	Define Collision	Remember	9
6	State different types of collision resolving techniques	Remember	9
7	Define Separate Chaining	Remember	9
8	Define Open Addressing	Remember	9
9	Define Linear probing	Remember	9
10	Define Quadratic Probing	Remember	9
11	Define Double Hashing	Remember	9
12	Define rehashing	Remember	9
13	List the uses of hash table	Understand	9
14	Define sorting and list the different types of sorting techniques	Remember	8
15	Discuss the advantage of Quick sort and its time complexity	Understand	8
16	State the main idea behind Selection sort	Remember	8
17	Discuss the time complexity of Heap sort	Understand	8
18	Discuss the main idea behind Insertion sort	Understand	8
19	Discuss is the space complexity of Radix sort?	Understand	8
20	Compare efficiencies of quick sort and heap sort	Understand	8
Part – B (Long Answer Questions)			
1	Explain linear search with example	Understand	8
2	Explain Binary search with example	Understand	8
3	Differentiate linear search algorithm with binary search algorithm.	Understand	8
4	Define hashing and discuss the different hashing functions with an example.	Understand	9
5	Define collision and discuss any two collision resolution techniques	Understand	9
6	Explain Chaining with an example	Understand	9
7	Compare different sorting techniques	Understand	8
8	Write C programs for implementing Quick sort to arrange a list of integers in ascending order	Apply	8
9	Write C programs for implementing Merge sort to arrange a list of integers in ascending order	Apply	8
10	State and explain insertion sort with an example	Apply	8

11	State and explain selection sort with an example	Apply	8
12	State and explain radix sort with an example	Apply	8
13	State and explain heap sort with an example	Apply	8
14	State and explain quick sort with an example	Apply	8
15	Explain quick sort algorithm and simulate it for the following data 20, 35, 10, 16, 54, 21, 25	Apply	8

Part – C (Problem Solving and Critical Thinking)

1	Apply binary search and find the average number of comparisons required to find an element 11,15,17,19,21,25,27,29,31	Apply	8
2	Using linear search, delete the number 26 from the following list of numbers and give the steps 10 6 3 7 17 26 56 32 87	Apply	8
3	Apply insertion sort on the following elements 3, 1, 4,7,5,9,2,6,5,10	Apply	8
4	Apply the selection sort on the following elements 21,11,5,78,49, 54,72,88	Apply	8
5	Rearrange the following numbers using Quick sort procedure. 42, 12, 18, 98, 67, 83, 8, 10, 71	Apply	8
6	Trace the quick sort algorithm for the following list of numbers. 90,77,60,99,55,88,66	Apply	8
7	Apply the following numbers using radix sort. 39, 27, 21, 44, 18, 6, 427, 117, 237, 5671 and 600	Apply	8
8	Apply radix sort on the following list of elements 45,37,05,09,06,11,18,27	Apply	8
9	Apply heap sort on list of elements 14,12,9,8,7,10,18,20,30	Apply	8
10	Explain the heap sort algorithm by tracing the following elements stepwise 3, 5, 9, 7, 1, 4, 6, 8, 2	Apply	8
11	Use quadratic probing to fill the Hash table of size 11. Data elements are 23,0,52,61,78,33,100,8,90,10,14,	Apply	9
12	Analyze input (371, 323, 173, 199, 344, 679, 989) and hash function $h(x)=x \text{ mod } 10$. Show the result Separate Chaining, linear probing	Apply	9
13	Analyze input (371, 323, 173, 199, 344, 679, 989) and hash function $h(x)=x \text{ mod } 10$. Show the result using quadratic probing, and double hashing $h_2(x)=7 - (x \text{ mod } 7)$.	Apply	9
14	Apply quadratic hashing to fill the hash table of size 11 elements 20,5,10,22,33,40,50,30,51,31	Apply	9
15	Show the each step of hash table entries for the given data set using linear probing 12,45,67,88,27,78,20,62,36,55 (size=10)	Apply	9

UNIT-V

Part - A (Short Answer Questions)

1	Define balanced search tree	Remember	6
2	Define binary search tree with example	Remember	6
3	State the operations on binary search tree	Remember	6
4	Compare binary tree and binary search tree	Understand	6
5	Define balance factor and what is the height of an AVL tree	Understand	6
6	Define AVL tree with example	Remember	6
7	List the different AVL tree rotations to insert a node	Remember	6
8	Discuss the drawbacks of AVL trees	Understand	6
9	Define splay tree	Remember	6
10	Define B-tree with example	Remember	6
11	Discuss the different operation's on B-Trees	Remember	6
12	write the properties of B-Trees	Remember	6

13	Explain the procedure to insert a node into B-Tree	Apply	6
14	State the properties of red black tree	Remember	6
15	Define and discuss the properties of tries	Remember	6
16	List some pattern matching algorithms	Remember	6
17	Discuss the time and space needed by Knuth Morris Pratt algorithm	Understand	6
18	List types of Tries.	Remember	6
19	Define Prefixes and Suffixes	Remember	6
20	Define failure function in KMP algorithm	Understand	6

Part - B (Long Answer Questions)

1	Describe the insertion, deletion ,searching operations on binary search trees	Understand	6
2	Explain the insertion operation on AVL trees	Understand	6
3	Describe the insertion, searching operations on B-Trees	Understand	6
4	Explain Knuth-Morris-Pratt algorithm with example	Understand	6
5	Define binary search tree. Construct the binary search Tree for the below given data. P, F, B, H, G, S, R, Y, T, W, Z	Apply	6
6	State the properties of Red-Black trees with example.	Understand	6
7	Write a short note on tries	Understand	6
8	Compare different search trees with their time complexities	Understand	6
9	Explain various rotations of AVL Trees maintaining balance factor while insertion takes place.	Understand	6
10	Explain Splay trees with example.	Understand	6

Part – C (Problem Solving and Critical Thinking)

1	Write a C program that uses functions to perform the following: a) Create a binary search tree of characters. b) Traverse the above Binary search tree recursively in Post order.	Apply	7
2	Give an algorithm for constructing a binary search tree. While constructing the tree, take care that duplicate values are not added. Trace the algorithm on 2,5,9,6,12,10,13,8	Apply	6
3	Construct a binary search tree for the following 80, 40, 75, 30, 20, 90, 50	Apply	6
4	Construct a binary search tree for the following 100, 50, 200, 25, 90, 80, 150	Apply	6
5	Insert the following elements into an empty AVL Tree 20,15,5,10,12,17,25,19	Apply	6
6	Construct an AVL Tree for following elements:10,20,15,3,2,16,18,26	Apply	6
7	Construct AVL Tree for the following elements C,O,M,P,U,T,I,N,G	Apply	6
8	Construct an AVL Tree for following elements:10,9,8,7,6,5,4,3,2,1	Apply	6
9	Construct a B-tree of order 3 with the following elements 10,20,15,3,2,16,21,25,30,40	Apply	6
10	Insert the following elements into an empty B-tree of order 5 3,14,7,1,8,5,11,17,13,6,23,12,20,4,16,18,24,25,19	Apply	6
11	Construct a B-tree of order 3 with the following elements 25,10,20,30,80,40,50,60,82,70,90,85,93	Apply	6
12	Construct a B-tree of order 7 with the following elements 4,40,23,50,11,34,62,78,66,22,90,59,25,72,64,77,39,12	Apply	6

13	Write a C program that uses functions to perform the following: a) Create a binary search tree of integers. b) Traverse the above Binary search tree non recursively in inorder.	Apply	6
14	Write a C program to perform the following operation: a) Insertion into a B-tree.	Apply	6
15	Find the failure function for the pattern "abacbba"	Apply	6
16	Define failure function of KMP for the pattern "sisis"	Apply	6
17	Find the failure function for the pattern "abacab"	Apply	6
18	Apply KMP algorithm on pattern "abacab" and text "abacaabaccabacabaabb"	Apply	6
19	Apply KMP algorithm on pattern "abaa" and text "abbbaababaab"	Apply	6
20	Write a C program for implementing Knuth-Morris-Pratt pattern matching algorithm to determine the index of the string S1 of length m in string S2 of length n where $m < n$	Apply	6

Prepared By: Mr. Ch. Suresh Kumar Raju, Associate Professor

HOD, IT