INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad-500043

COMPUTER SCIENCE AND ENGINEERING

TUTORIAL QUESTION BANK

Course Title	**ADVANCED DATA STRUCTURES**				
Course Code	**BCSB02**				
Programme	M.Tech				
Semester	I	CSE			
Course Type	Core				
Regulation	**IARE - R18**				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	-	-
Chief Coordinator	Ms. S Swarajya Laxmi, Assisstant Professor, CSE				
Course Faculty	Ms. S Swarajya Laxmi, Assisstant Professor, CSE				

COURSE OBJECTIVES:

The course should enable the students to:	
I	Understand the data structures and techniques of algorithm analysis.
II	Solve problems using different data structures and compare their performance and tradeoffs.
III	Illustrate the implementation of linked data structures such as linked lists and binary trees.
IV	Understand graph algorithms such as shortest path and minimum spanning tree.
V	Learn advanced data structures such as balanced search trees, hash tables, priority queues

COURSE OUTCOMES (COs):

CO 1	Implementation of hash tables, including collision avoidance and resolution schemes.
CO 2	Analyze how to balance a binary search tree using rotation methods and color changing methods.
CO 3	Solve problems using graph algorithms, including single-source and all-pairs shortest paths, and minimum spanning tree algorithms.
CO 4	Relates all binary heap trees to form a large binomial queue for large data structures creation.
CO 5	Reconstructs such applications that take the advantage of a trie's ability to quickly search for, insert, and delete entries into the dictionary.

COURSE LEARNING OUTCOMES (CLOs):

BCSB02.01	Analyze time and space complexity of an algorithm for their performance analysis
BCSB02.02	Understand arrays, single and doubly linked lists in linear data structure and tress , graphs in non-linear data structure
BCSB02.03	Master a variety of advanced abstract data type (ADT) and their implementations
BCSB02.04	Understand dynamic data structures and relevant standard algorithms
BCSB02.05	Design and analyze and Concepts of heap, priority queue
BCSB02.06	Analyze probing methods like linear probing and quadratic probing
BCSB02.07	Understand and implement hash table and linear list representation
BCSB02.08	Understand the properties of binary tress and implement recursive and non-recursive traversals
BCSB02.09	Understand graphs terminology, representations and traversals in Graphs
BCSB02.10	Implement Depth First Search and Breath First Searching methods of non –linear data structures
BCSB02.11	Analyze dijkstra's algorithm for single source shortest path problem for minimum cost spanning trees
BCSB02.12	Implement binary search ADT for finding parent node, smallest and largest values in binary search
BCSB02.13	Understand and implement operations and applications of red-Black and splay Trees
BCSB02.14	Implement Huffman Coding and decoding for text compression

TUTORIAL QUESTION BANK

S No	QUESTIONS	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes (CLOs)
UNIT-I				
OVERVIEW OF DATA STRUCTURES				
Part - A (Short Answer Questions)				
1	Define the term algorithm and state the criteria the algorithm should satisfy.	Remember	CO 1	BCSB02.03
2	Define Time Complexity and Space Complexity.	Remember	CO 1	BCSB02.02
3	Define asymptotic notations: big 'Oh', omega and theta.	Remember	CO 1	BCSB02.02
4	Describe best case, average case and worst case efficiency of an algorithm.	Understand	CO 1	BCSB02.02
5	How do you measure the algorithm running time.	Understand	CO 1	BCSB02.02
6	Describe the role of space complexity and time complexity in measuring the performance of a program.	Remember	CO 1	BCSB02.02
7	Define data structure.	Remember	CO 1	BCSB02.02
8	List linear and nonlinear data structures.	Remember	CO 1	BCSB02.04
9	List out any four applications of data structures.	Remember	CO 1	BCSB02.02
10	Define Linked List? State the different types of linked lists.	Remember	CO 1	BCSB02.01
11	List the advantages and disadvantages of linked list.	Understand	CO 1	BCSB02.01
12	Define Stack? List the applications of stack.	Understand	CO 1	BCSB02.01
13	Define Queue? List the applications of queue.	Understand	CO 1	BCSB02.01
14	List out the basic operations that can be performed on a stack and queue.	Understand	CO 1	BCSB02.04
15	Define Circular Queue? List the operations that can be performed on Circular Queue.	Understand	CO 1	BCSB02.04
Part - B (Long Answer Questions)				
1	Discuss various the asymptotic notations used for best case average case and worst case analysis of algorithms.	Remember	CO 1	BCSB02.02
2	Explain Performance Analysis in Detail.	Understand	CO 1	BCSB02.02
3	Explain time and space complexities in detail.	Understand	CO 1	BCSB02.02
4	Explain the different operations on singly liked list.	Understand	CO 1	BCSB02.01
5	Explain concatenation of singly linked lists.	Remember	CO 1	BCSB02.01
6.	Explain circular linked list operations.	Remember	CO 1	BCSB02.01
7.	Explain doubly linked list operations.	Remember	CO 1	BCSB02.02
8	List the advantages and disadvantages of doubly linked list over singly linked list? Explain the applications of doubly linked lists.	Remember	CO 1	BCSB02.01
9.	Write an algorithm to insert and delete a key in a circular queue.	Remember	CO 1	BCSB02.01
10	Write an algorithm for basic operations on Stack and queue.	Understand	CO 1	BCSB02.01
11	Explain DEQUEUE ADT and its operations.	Understand	CO 1	BCSB02.04
12	Implement a queue using two stacks.	Understand	CO 1	BCSB02.04
13	Implement a Circular queue of integer of user specified size and write the functions for intilize () enque () and deque().	Understand	CO 1	BCSB02.01
14	Discuss max priority queue ADT with examples	Understand	CO 1	BCSB02.03
15	List the advantages of priority queue? Explain the implementation of Priority Queue.	Remember	CO 1	BCSB02.04
UNIT- II				
DICTIONARIES, HASH TABLES				
Part-A (Short Answer Questions)				
1	Define Hashing.	Remember	CO 2	BCSB02.05
2	Define Hash Function.	Remember	CO 2	BCSB02.05
3	List different types of popular hash functions.	Remember	CO 2	BCSB02.06
4	Define Collision.	Remember	CO 2	BCSB02.05

5	State different types of collision resolving techniques.	Understand	CO 2	BCSB02.05
6	Define Separate Chaining.	Remember	CO 2	BCSB02.05
7	Define Open Addressing.	Understand	CO 2	BCSB02.05
8	Define Linear probing.	Understand	CO 2	BCSB02.05
9	Define Quadratic Probing.	Remember	CO 2	BCSB02.05
10	Define Double Hashing.	Understand	CO 2	BCSB02.08
11	Define rehashing .	Remember	CO 2	BCSB02.06
12	List the uses of hash table.	Remember	CO 2	BCSB02.05
13	Define linear list representation.	Remember	CO 2	BCSB02.05
14	Define extendible hashing.	Understand	CO 2	BCSB02.05
15	Define collision resolution.	Understand	CO 2	BCSB02.05
	Part-B (Long Answer Questions)			
1	Discuss the different hashing functions with an example.	Remember	CO 2	BCSB02.05
2	Discuss any two collision resolution techniques.	Understand	CO 2	BCSB02.08
3	Explain Chaining with an example.	Remember	CO 2	BCSB02.05
4	List different operations performed on list.	Understand	CO 2	BCSB02.05
5	Discuss the method of rehashing in detail.	Remember	CO 2	BCSB02.05
6	Analyze the methods of probing.	Analyze	CO 2	BCSB02.05
7	Explain the process of collision resolution.	Understand	CO 2	BCSB02.08
8	List some differences between rehashing and extendible hashing.	Understand	CO 2	BCSB02.08
9	Analyze the method of searching a linear list.	Understand	CO 2	BCSB02.05
10	Explain the process involved in quadratic probing.	Understand	CO 2	BCSB02.05
11	Discuss linear probing method and give some advantages and disadvantages.	Understand	CO 2	BCSB02.05
12	Suppose you are given the following set of keys to insert into a hash table that holds exactly 11 values: 113 , 117 , 97 , 100 , 114 , 108 , 116 , 105 , 99 Which of the following best demonstrates the contents of the has table after all the keys have been inserted using linear probing.	Analyze	CO 2	BCSB02.08
13	Explain various Open Addressing Methods for Collision Resolution	Understand	CO 2	BCSB02.05
14	Discuss the method of double hashing.	Understand	CO 2	BCSB02.05
15	State dictionary data Structure with example.	Understand	CO 2	BCSB02.05
	UNIT III			
	TREES AND GRAPHS			
	Part-A(Short Answer Questions)			
1	Define Tree.	Understand	CO 3	BCSB02.09
2	List the applications of Trees.	Remember	CO 3	BCSB02.11
3	Define the terms node, degree, siblings, depth/height, level.	Understand	CO 3	BCSB02.10
4	Define path in a tree.	Remember	CO 3	BCSB02.10
5	Define binary Tree.	Remember	CO 3	BCSB02.10
6	Define full binary tree.	Understand	CO 3	BCSB02.10
7	Define complete binary tree.	Understand	CO 3	BCSB02.10
8	Define a right-skewed binary tree and Left-skewed binary tree.	Analyze	CO 3	BCSB02.10
9	State the properties of a Binary Tree.	Understand	CO 3	BCSB02.09
10	Discuss how to represent Binary Tree.	Understand	CO 3	BCSB02.10
11	Define graph.	Understand	CO 3	BCSB02.10
12	Discuss representation of graph with examples.	Understand	CO 3	BCSB02.10
13	List the different graph traversals.	Remember	CO 3	BCSB02.10
14	State two properties of undirected graphs.	Understand	CO 3	BCSB02.10
15	Define minimum cost spanning tree.	Understand	CO 3	BCSB02.10
16	List the applications of graphs.	Remember	CO 3	BCSB02.10
17	How is traversal of a graph is different from tree. Give reason.	Remember	CO 3	BCSB02.09
18	Give the data structure used in standard implementation of Breadth First Search.	Remember	CO 3	BCSB02.09

Part–B(LongAnswerQuestions)				
1	Explain Binary tree ADT.	Understand	CO 3	BCSB02.09
2	Discuss representation of binary tree.	Remember	CO 3	BCSB02.09
3	Explain tree traversals with example.	Understand	CO 3	BCSB02.11
4	Discuss max priority queue ADT with examples.	Remember	CO 3	BCSB02.10
5	List the advantages of priority queue? Explain the implementation of Priority Queue.	Understand	CO 3	BCSB02.10
6	Define threaded binary tree? Explain the impact of such a representation on the tree traversal procedure.	Understand	CO 3	BCSB02.10
7	Explain graph ADT.	Understand	CO 3	BCSB02.10
8	Explain different ways representation of graphs.	Remember	CO 3	BCSB02.11
9	Explain BFS graphs traversal algorithms with suitable example.	Understand	CO 3	BCSB02.10
10	Explain DFS graphs traversal algorithms with suitable example.	Understand	CO 3	BCSB02.10
UNIT IV				
SEARCH TREES I				
Part – A (Short Answer Questions)				
1	Define balanced search tree.	Understand	CO 4	BCSB02.14
2	Define binary search tree with example.	Analyze	CO 4	BCSB02.14
3	State the operations on binary search tree.	Understand	CO 4	BCSB02.14
4	Compare binary tree and binary search tree.	Remember	CO 4	BCSB02.14
5	Define balance factor and what is the height of an AVL tree.	Understand	CO 4	BCSB02.14
6	Define AVL tree with example.	Understand	CO 4	BCSB02.14
7	List the different AVL tree rotations to insert a node .	Understand	CO 4	BCSB02.14
8	Discuss the drawbacks of AVL trees.	Remember	CO 4	BCSB02.14
9	Draw the binary search tree that is created if the following numbers are inserted in the tree in the given order. 12 15 3 35 21 42 14	Analyze	CO 4	BCSB02.14
10	Draw a balanced binary search tree containing the following numbers. 12 15 3 35 21 42 14	Analyze	CO 4	BCSB02.14
11	List the properties of binary search trees.	Understand	CO 4	BCSB02.14
12	List the basic operations of a binary search tree.	Understand	CO 4	BCSB02.14
13	The preorder traversal sequence of a binary search tree is 30, 20, 10, 15, 25, 23, 39, 35, 42. Write the postorder traversal sequence of the tree?	Remember	CO 4	BCSB02.14
14	List the properties of avl trees.	Understand	CO 4	BCSB02.14
15	Define balance factor of an avl tree.	Understand	CO 4	BCSB02.14
Part – B (Long Answer Questions)				
1	In the binary search tree below, carry out the following operations in sequence: Add 5, add 17, delete 23, delete 9 for the tree with following numbers 9 3 12 10 15 23 19 21.	Understand	CO 4	BCSB02.14
2	Explain insertion operation in binary search tree with example.	Understand	CO 4	BCSB02.14
3	Analyze deletion operation in binary search tree with example.	Remember	CO 4	BCSB02.14
4	Write a program for finding the smallest and largest values in the binary search tree.	Understand	CO 4	BCSB02.14
5	Discuss the method to find the parent of a given node.	Understand	CO 4	BCSB02.14
6	Describe binary search ADT in detail.	Understand	CO 4	BCSB02.14
7	Build an AVL tree with the following values: 15, 20, 24, 10, 13, 7, 30, 36, 25	Analyze	CO 4	BCSB02.14
8	Construct AVL Tree for the following elements C,O,M,P,U,T,I,N,G.	Analyze	CO 4	BCSB02.14
9	Construct an AVL Tree for following elements:10,20,15,3,2,16,18,26.	Analyze	CO 4	BCSB02.14
10	Construct a binary search tree for the following 100, 50, 200, 25, 90, 80, 150	Analyze	CO 4	BCSB02.14
UNIT V				
SEARCH TREES II				
Part - A (Short Answer Questions)				
1	Define splay tree.	Understand	CO 5	BCSB02.10

2	Define B-tree.	Understand	CO 5	BCSB02.10
3	Write the properties of B-Trees.	Remember	CO 5	BCSB02.10
4	State the properties of red black tree.	Understand	CO 5	BCSB02.10
5	List types of Tries.	Analyze	CO 5	BCSB02.10
6	Define Prefixes and Suffixes.	Understand	CO 5	BCSB02.10
7	Define failure function in KMP algorithm.	Understand	CO 5	BCSB02.10
8	List applications of B-trees.	Analyze	CO 5	BCSB02.11
9	List applications of splay-trees.	Understand	CO 5	BCSB02.11
10	List applications of red black-trees.	Understand	CO 5	BCSB02.11
11	State the special property of red-black trees.	Understand	CO 5	BCSB02.11
12	Why Red-black trees are preferred over hash tables.	Analyze	CO 5	BCSB02.12
13	Write about the operations performed on splay trees.	Understand	CO 5	BCSB02.12
14	Write the disadvantage of splay trees.	Understand	CO 5	BCSB02.12
15	List advantages of red black trees.	Understand	CO 5	BCSB02.12
Part - B (Long Answer Questions)				
1	Discuss the different operation's on B-Trees.	Understand	CO 5	BCSB02.12
2	Explain the procedure to insert a node into B-Tree.	Understand	CO 5	BCSB02.12
3	Define and discuss the properties of tries.	Remember	CO 5	BCSB02.13
4	List some pattern matching algorithm.	Understand	CO 5	BCSB02.13
5	Discuss the time and space needed by Knuth Morris Pratt algorithm'.	Remember	CO 5	BCSB02.13
6	Find the failure function for the pattern"abacbba".	Understand	CO 5	BCSB02.13
7	Define failure function of KMP for the pattern "sisis".	Understand	CO 5	BCSB02.13
8	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.	Analyze	CO 5	BCSB02.14
9	Construct a B-tree of order 3 with the following elements 25,10,20,30,80,40,50,60,82,70,90,85,93.	Analyze	CO 5	BCSB02.14
10	Find the failure function for the pattern"abacab".	Understand	CO 5	BCSB02.14

Prepared by:
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