



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

COMPUTER SCIENCE AND ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	DESIGN AND ANALYSIS OF ALGORITHMS
Course Code	:	AITB05
Program	:	B.Tech
Semester	:	IV
Branch	:	Computer Science and Engineering
Section	:	A B C D
Academic Year	:	2019 - 2020
Course Faculty	:	Dr.M Purushotham Reddy, Associate Professor Dr.K Suvarchala, Associate Professor Ms.G Geetha, Assistant Professor Ms.Gopu srileka, Assistant Professor Ms.E Umashankari, Assistant Professor

COURSE OBJECTIVES:

The course should enable the students to:	
I	Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
II	Solve problems using data structures such as binary search trees, and graphs and writing programs for these solutions.
III	Choose the appropriate data structure and algorithm design method for a specified application.
IV	Solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking, and branch and bound and writing programs for these solutions.

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
MODULE-I						
1	What is meant algorithm?	An algorithm is set of instructions that if followed accomplishes a particular task.	Remember	CO1	CLO1	AITB05.01
2	List the characteristics that any algorithm satisfies.	<ul style="list-style-type: none">• Input• Output• Definiteness• Finiteness• Effectiveness	Remember	CO1	CLO1	AITB05.01
3	What are the types of algorithm?	<ul style="list-style-type: none">• Recursive algorithms.• Dynamic programming algorithm.• Backtracking algorithm.• Divide and conquer	Remember	CO1	CLO1	AITB05.01

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		<p>algorithm.</p> <ul style="list-style-type: none"> • Greedy algorithm. • Brute Force algorithm. • Randomized algorithm. 				
4	What is the purpose of algorithm?	An algorithm is a step by step method of solving a problem. It is commonly used for data processing, calculation and other related computer and mathematical operations.	Remember	CO1	CLO1	AITB05.01
5	Why do we need algorithm?	We learn by seeing others solve problems and by solving problems by ourselves. Being exposed to different problem-solving techniques and seeing how different algorithms are designed helps us to take on the next challenging problem that we are given. ... Algorithms are often quite different from one another.	Remember	CO1	CLO1	AITB05.01
6	What are the advantages of algorithm?	It is a step-wise representation of a solution to a given problem, which makes it easy to understand. An algorithm uses a definite procedure. It is not dependent on any programming language, so it is easy to understand for anyone even without programming knowledge.	Remember	CO1	CLO1	AITB05.03
7	What do you mean by recursive algorithm?	A recursive algorithm is an algorithm which calls itself with "smaller (or simpler)" input values, and which obtains the result for the current input by applying simple operations to the returned value for the smaller (or simpler) input.	Remember	CO1	CLO1	AITB05.01
8	What is algorithm testing?	Introduces software testing and focuses on a type of testing relevant to algorithms called unit testing. provides a specific example of an algorithm and a prepared suite of unit tests, and provides some rules-of-thumb for testing algorithms in general.	Remember	CO1	CLO1	AITB05.01
9	What is finiteness in algorithm?	The algorithm must always terminate after a finite number of steps	Remember	CO1	CLO1	AITB05.01
10	What do you mean by algorithm specifications?	An algorithm is an efficient method that can be expressed within finite amount of time and space. An algorithm is the best way to represent the solution of a particular problem in a very simple and efficient way.	Remember	CO1	CLO1	AITB05.01

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
11	What is Big O notation in algorithm?	Big O notation is used to classify algorithms according to how their running time or space requirements grow as the input size grows. It represents worst case time complexity.	Remember	CO1	CLO3	AITB05.03
12	What is Omega notation?	Omega tells us the lower bound of the runtime of a function.	Remember	CO1	CLO3	AITB05.03
13	What does asymptotic mean?	The definition of asymptotic is a line that approaches a curve but never touches.	Understand	CO1	CLO3	AITB05.03
14	What is performance analysis of algorithm?	Analysis of algorithm is the process of analyzing the problem-solving capability of the algorithm in terms of the time and size required (the size of memory for storage while implementation).	Remember	CO1	CLO2	AITB05.02
15	What is the time complexity of algorithm?	The amount of time taken by a set of code or algorithm to process or run as a function of the amount of input.	Remember	CO1	CLO2	AITB05.02
16	What do you mean by space complexity of an algorithm?	Space complexity of an algorithm quantifies the amount of space or memory taken by an algorithm to run as a function of the length of the input.	Remember	CO1	CLO2	AITB05.02
17	What is amortized cost algorithm?	The amount we charge an operation is called its amortized cost.	Remember	CO1	CLO3	AITB05.03
18	What is the basic principle of divide and conquer?	A divide-and-conquer algorithm works by recursively breaking down a problem into two or more sub-problems of the same or related type, until these become simple enough to be solved directly. The solutions to the sub-problems are then combined to give a solution to the original problem.	Understand	CO1	CLO4	AITB05.04
19	What are the advantages of divide and conquer?	With the divide and conquer method, it reduces the degree of difficulty since it divides the problem into sub problems that are easily solvable, and usually runs faster than other algorithms would. It also uses memory caches effectively.	Understand	CO1	CLO4	AITB05.04
20	What is binary search and its algorithm?	Binary search is an efficient algorithm for finding an item from a sorted list of items. It works by repeatedly dividing in half the portion of the list that could contain the item, until you've narrowed down the possible locations to just one.	Understand	CO1	CLO4	AITB05.04
21	What is time complexity of	$O(\log n)$	Understand	CO1	CLO4	AITB05.04

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	binary search?					
22	What is the algorithm for quick sort?	The algorithm starts by picking a single item which is called pivot and moving all smaller items before it, while all greater elements in the later portion of the list.	Remember	CO1	CLO4	AITB05.04
23	What is time complexity of quick sort?	$O(n \log n)$	Understand	CO1	CLO4	AITB05.04
24	What is the technique used in merge sort algorithm?	Divide and Conquer.	Understand	CO1	CLO5	AITB05.05
25	What is the complexity of merge sort?	$O(n \log n)$	Understand	CO1	CLO5	AITB05.05
26	What is Strassen's matrix multiplication?	Strassen's matrix is a Divide and Conquer method that helps us to multiply two matrices (of size $n \times n$).	Remember	CO1	CLO5	AITB05.05
27	What is the time complexity of Strassen's matrix multiplication?	$O(n^{2.80})$	Understand	CO1	CLO5	AITB05.05

MODULE-II

1	What is set?	A set is a collection of distinct elements. The Set can be represented, for example, as $S1 = \{1, 2, 5, 10\}$.	Understand	CO 2	CLO6	AITB05.
2	Define Traversal?	Traversal of a binary tree involves examining every node in the tree.	Remember	CO 2	CLO6	AITB05.
3	Define Search?	Search involves visiting nodes in a graph in a systematic manner, and may or may not result into a visit to all nodes.	Remember	CO 2	CLO7	AITB05.
4	What is disjoint set?	A disjoint-set data structure is a data structure that keeps track of a set of elements partitioned into a number of disjoint (non-overlapping) subsets.	Remember	CO 2	CLO 7	AITB05.
5	What are disjoint set operations?	The disjoint set operations are 1. Union 2. Find	Remember	CO 2	CLO 8	AITB05.
6	Define Disjoint set Union	If S_i and S_j are two disjoint sets, then their union $S_i \cup S_j$ consists of all the elements x such that x is in S_i or S_j .	Remember	CO 2	CLO 8	AITB05.
7	Define Disjoint Union	To perform disjoint set union between two sets S_i and S_j can take any one root and make it sub-tree of the other.	Remember	CO 2	CLO 8	AITB05.
8	What is find operation?	To perform find operation, along with the tree structure we need to maintain the name	Understand	CO 2	CLO 9	AITB05.

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		of each set. So, we require one more data structure to store the set names. The data structure contains two fields. One is the set name and the other one is the pointer to root.				
9	Define union-find algorithm?	A union-find algorithm is an algorithm that performs two useful operations on such a data structure: Find: Determine which subset a particular element is in. This can be used for determining if two elements are in the same subset.	Remember	CO 2	CLO 9	AITB05
10	Describe Weighting rule for Union?	If the number of nodes in the tree with root i is less than the number in the tree with the root j, then make 'j' the parent of i; otherwise make 'i' the parent of j.	Understand	CO 2	CLO 9	AITB05.
11	What are Minimum Spanning Trees?	A spanning tree for a connected graph is a tree whose vertex set is the same as the vertex set of the given graph, and whose edge set is a subset of the edge set of the given graph. i.e., any connected graph will have a spanning tree.	Understand	CO 2	CLO 10	AITB05.
12	Define BFST?	Spanning trees obtained using BFS then it called Breadth First Spanning Trees(BFST)	Remember	CO 2	CLO 10	AITB05.
13	What is Depth First Search	It involves exhaustive searches of all the nodes by going ahead, if possible, else by backtracking. Here, the word backtrack means that when you are moving forward and there are no more nodes along the current path, you move backwards on the same path to find nodes to traverse	Understand	CO2	CLO 10	AITB05.
14	What is Graph Traversal?	Graph traversal (also known as graph search) refers to the process of visiting (checking and/or updating) each vertex in a graph. Such traversals are classified by the order in which the vertices are visited.	Understand	CO 2	CLO 3	AITB05.
15	What are the traversal techniques?	Preorder traversal, Inorder traversal, Postorder traversal.	Understand	CO 2	CLO 4	AITB05.
MODULE-III						
1	Define a 'Greedy	A greedy algorithm is used to	Remember	CO 3	CLO 11	AITB05.11

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	algorithm'?	construct a Huffman tree during Huffman coding where it finds an optimal solution.				
2	List applications of greedy method.	1. Dijkstra's algorithm 2. Prims algorithm 3. Huffman tress	Remember	CO 3	CLO 11	AITB05.11
3	Define Huffman tree?	Huffman tree is a full binary tree in which each leaf of the tree corresponds to a letter in the given alphabet.	Remember	CO 3	CLO 11	AITB05.11
4	Define Job sequencing problem	A Simple Solution is to generate all subsets of given set of jobs and check individual subset for feasibility of jobs in that subset.	Remember	CO 3	CLO 11	AITB05.11
5	Define minimum cost spanning tree	A spanning tree with weight less than or equal to the weight of every other spanning tree.	Remember	CO 3	CLO11	AITB05.11
6	Define optimal solution.	An optimal solution is a feasible solution where the objective function reaches its maximum (or minimum) value	Remember	CO 3	CLO12	AITB05.12
7	List out the applications of greedy method.	Job Sequenced with deadline Knapsack problem Huffman coding	Remember	CO 3	CLO12	AITB05.12
8	Define knapsack problem	The knapsack problem is an optimization problem used to illustrate both problem and solution.	Remember	CO 3	CLO12	AITB05.12
9	Define subset paradigm	At each stage a decision is made whether a particular input is in the optimal solution. This is called subset paradigm.	Remember	CO 3	CLO13	AITB05.13
10	State single source shortest path problem	The single-source shortest path problem, in which we have to find shortest paths from a source vertex v to all other vertices in the graph.	Remember	CO 3	CLO13	AITB05.13
1	What is a spanning tree	A subgraph of G that connects all of the vertices and is a tree is called a spanning tree	Remember	CO 3	CLO 11	AITB05.11
2	Define dynamic programming	Dynamic Programming solves problems by combining the solutions of subproblems.	Remember	CO 3	CLO 13	AITB05.13
3	List characteristics of Dynamic Programming	1. Optimal Substructure 2. Overlapping subproblems	Remember	CO 3	CLO 13	AITB05.13
4	List Elements of Dynamic Programming	1. Substructure 2. Table Structure 3. Bottom-up Computation	Remember	CO 3	CLO 13	AITB05.13
5	List components of Dynamic programming	1. Stages 2. States 3. Decision 4. Optimal policy	Remember	CO 3	CLO 13	AITB05.13

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
6	List applications of dynamic programming	1. 0/1 knapsack problem 2. Mathematical optimization problem 3. All pair Shortest path problem	Remember	CO 3	CLO 14	AITB05.14
7	Define matrix chain multiplication complexity	Time Complexity: $O(n^3)$ Auxiliary Space: $O(n^2)$	Remember	CO 3	CLO 14	AITB05.14
8	Define traveling sales person problem.	The problem is to find the shortest possible route that visits every city exactly once and returns to the starting point.	Remember	CO 3	CLO 14	AITB05.14
9	Define principle of optimality	It states that an optimal sequence of decisions or choices, each sub sequences must also be optimal.	Remember	CO 3	CLO 15	AITB05.15
10	Define the time complexity of all pairs shortest paths problem.	time complexity of this algorithm is $O(n^3)$	Remember	CO 3	CLO 15	AITB05.15

MODULE-IV

1	What is meant by backtracking?	Backtracking is an algorithmic-technique for solving problems recursively by trying to build a solution incrementally, one piece at a time, removing those solutions that fail to satisfy the constraints of the problem at any point of time	Understand	CO4	CLO16	AITB05.16
2	Is backtracking same as recursion?	Backtracking is different from recursion. In recursion function calls itself until reaches a base case. where as in backtracking you use recursion in order to explore all the possibilities until you get the best result for the problem.	Remember	CO4	CLO16	AITB05.16
3	What is 8 queen problem	The eight queens problem is the problem of placing eight queens on an 8×8 chessboard such that none of them attack one another (no two are in the same row, column, or diagonal).	Remember	CO4	CLO16	AITB05.16
4	How many solutions does 8 queens problem have?	The eight queens puzzle has 92 distinct solutions	Remember	CO4	CLO16	AITB05.16
5	Is subset a sum?	Input: The given set and subset, size of set and subset, a total of the subset, number of elements in the subset and the given sum. Output: All possible subsets whose sum is the same as the given sum.	Remember	CO4	CLO17	AITB05.17

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
6	What is the symbol of subset?	The symbol " \subseteq " means "is a subset of". The symbol " \subset " means "is a proper subset of"	Understand	CO4	CLO17	AITB05.17
7	What do u mean by subset?	The set A is contained inside the set B. The subset relationship is denoted as $A \subset B$.	Understand	CO4	CLO17	AITB05.17
8	How do you color a graph?	Graph coloring is nothing but a simple way of labelling graph components such as vertices, edges, and regions under some constraints. In a graph, no two adjacent vertices, adjacent edges, or adjacent regions are colored with minimum number of colors.	Understand	CO4	CLO18	AITB05.18
9	What is graph coloring algorithm?	Graph Coloring is a process of assigning colors to the vertices of a graph. It ensures that no two adjacent vertices of the graph are colored with the same color. Chromatic Number is the minimum number of colors required to properly color any graph.	Remember	CO4	CLO18	AITB05.18
10	What is chromatic number of graph?	The chromatic number of a graph is the smallest number of colors needed to color the vertices of so that no two adjacent vertices share the same color	Remember	CO4	CLO18	AITB05.18
11	What is Hamiltonian graph?	Every complete graph with more than two vertices is a Hamiltonian graph	Remember	CO4	CLO19	AITB05.19
12	What is meant by branch and Bound?	Branch and bound (BB, B&B, or BnB) is an algorithm design paradigm for discrete and combinatorial optimization problems, as well as mathematical optimization	Remember	CO4	CLO19	AITB05.19
13	What is difference between backtracking and branch and bound?	The main difference between backtracking and branch and bound is that the backtracking is an algorithm for capturing some or all solutions to given computational issues, especially for constraint satisfaction issues while branch and bound is an algorithm to find the optimal solution to many optimization problems,	Remember	CO4	CLO19	AITB05.19

MODULE-V

1	What is P class of	The class P consists of those	Remember	CO1	CLO1	AITB05.01
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S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	problems	problems that are solvable in polynomial time, i.e. these problems can be solved in time $O(n^k)$ in worst-case, where k is constant.				
2	What are NP class of problems?	The class NP consists of those problems that are verifiable in polynomial time..	Remember	CO1	CLO1	AITB05.01
3	What are NP complete problems?	NP complete problems is a collection of problems in NP whose solutions may or may not polynomial time, but however, it can proved that one of them may be solved in polynomial time, then all of them can.	Remember	CO1	CLO1	AITB05.01
4	What are NP complete problems?	NP-Hard problems is a collection of problems that do not have to be in NP, whose solutions are at least as hard as the NP-Complete problems. If a problem is in NP, and it's NP hard, then it is also NP-Complete.	Remember	CO1	CLO1	AITB05.01
5	State vertex cover of Graph problem?	A vertex-cover of an undirected graph $G = (V, E)$ is a subset of vertices $V' \subseteq V$ such that if edge (u, v) is an edge of G , then either u in V' or v in V' or both.	Remember	CO1	CLO1	AITB05.01
6	What is Clique problem?	In an undirected graph, a clique is a complete sub-graph of the given graph.	Remember	CO1	CLO1	AITB05.03
7	State MAX-CLIQUE problem	The Max-Clique problem is the computational problem of finding maximum clique of the graph. Max clique is used in many real-world problems.	Remember	CO1	CLO1	AITB05.01
8	What are decision problems?	Problems for which the answer is a Yes or a No such problems are known as decision problems.	Remember	CO1	CLO1	AITB05.01
9	What is an optimization problem?	Optimization problems are those for which the objective is to maximize or minimize some values.	Remember	CO1	CLO1	AITB05.01
10	What is a language?	A language is the totality of inputs for which the answer is Yes.	Remember	CO1	CLO1	AITB05.01
11	Define NP-Completeness.	A language B is NP-complete if it satisfies two conditions <ul style="list-style-type: none"> • B is in NP • Every A in NP is polynomial time reducible to B. 	Remember	CO1	CLO3	AITB05.03
12	What is NP-Hard	A problem is NP-hard if all problems in NP are polynomial time reducible to it, even though it may not be in NP itself.	Remember	CO1	CLO3	AITB05.03
13	What is Satisfiability?	SAT is a problem for which there is no polynomial-time algorithm.	Understand	CO1	CLO3	AITB05.03

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
14	What is a intractable problem?	problems for which there is no proof that there cannot be a polynomial-time algorithm are intractable.	Remember	CO1	CLO2	AITB05.02
15	What is Chromatic Number?	chromatic number is the minimum number of colors needed to color the vertices of a graph such that no two adjacent vertices have the same color.	Remember	CO1	CLO2	AITB05.02
16	What is non deterministic algorithm.	A nondeterministic algorithm is an algorithm that, even for the same input, can exhibit different behaviors on different runs	Remember	CO1	CLO2	AITB05.02
17	State Cooks Theorem	Cook's theorem , states that the Boolean satisfiability problem is NP-complete. That is, any problem in NP can be reduced in polynomial time by a deterministic Turing machine to the problem of determining whether a Boolean formula is satisfiable	Remember	CO1	CLO3	AITB05.03

Signature of the Faculty

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