

University of Mumbai

Examination 2020

Program: Information Technology

Curriculum Scheme: Rev2016

Examination: Third Year Semester V

Course Code: ITDLO5011 Course Name: Advanced Data Structures & Analysis of Algorithms

Time: 1 hour

Max. Marks: 50

For the students: - All the Questions are compulsory and carry equal marks.

Q1.	Master's theorem is used for?
Option A:	solving recurrences
Option B:	solving iterative relations
Option C:	analyzing loops
Option D:	calculating the time complexity of any code
Q2.	What is the result of the recurrences which fall under third case of Master's theorem (let the recurrence be given by $T(n) = a T(n/b) + f(n)$ and $f(n) = n^c$?
Option A:	$T(n) = O(n \log_{ba})$
Option B:	$T(n) = O(n^2)$
Option C:	$T(n) = O(f(n))$
Option D:	$T(n) = O(n^c \log n)$
Q3.	How many cases are there under Master's theorem?
Option A:	1
Option B:	2
Option C:	3
Option D:	4
Q4.	Solve with the help of recursive tree method. $T(n) = T(n/2) + T(n/4) + n$
Option A:	$T(n) = O(n \log n)$
Option B:	$T(n) = O(n)$
Option C:	$T(n) = O(\log n)$
Option D:	$T(n) = O(1)$
Q5.	Solve the following recurrence using forward substitution $T(n) = T(n-1) + n^3$
Option A:	$T(n) = O(n^4)$
Option B:	$T(n) = O(n^3)$
Option C:	$T(n) = O(n \log n)$
Option D:	$T(n) = O(n)$
Q6.	What is the maximum height of an AVL tree with p nodes?
Option A:	P
Option B:	$\log(p)$
Option C:	$\log(p)/2$
Option D:	$p/2$
Q7.	Which of the following is not a self-adjusting or self-balancing Binary Search

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	Tree
Option A:	Splay Tree
Option B:	AVL Tree
Option C:	Red Black Tree
Option D:	B-Tree
Q8.	A binary tree is balanced if the difference between left and right sub tree of every node is not more than...
Option A:	1
Option B:	3
Option C:	2
Option D:	0
Q9.	Given an empty AVL tree, how would you construct AVL tree when a set of numbers are given without performing any rotations?
Option A:	just build the tree with the given input
Option B:	find the median of the set of elements given, make it as root and construct the tree
Option C:	use trial and error
Option D:	use dynamic programming to build the tree
Q10.	Which of the following is TRUE?
Option A:	The cost of searching an AVL tree is $\theta(\log n)$ but that of a binary search tree is $O(n)$
Option B:	The cost of searching an AVL tree is $\theta(\log n)$ but that of a complete binary tree is $\theta(n \log n)$
Option C:	The cost of searching a binary search tree is $O(\log n)$ but that of an AVL tree is $\theta(n)$
Option D:	The cost of searching an AVL tree is $\theta(n \log n)$ but that of a binary search tree is $O(n)$
Q11.	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.
Option A:	2
Option B:	3
Option C:	4
Option D:	5
Q12.	Quick Sort can be categorized into which of the following?
Option A:	Brute Force technique
Option B:	Divide and conquer
Option C:	Greedy algorithm
Option D:	Dynamic programming
Q13.	What is the worst case complexity of Quick Sort?
Option A:	$O(n \log n)$
Option B:	$O(\log n)$
Option C:	$O(n)$
Option D:	$O(n^2)$

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Q14.	Which of the following is not true about Quick Sort?
Option A:	in-place algorithm
Option B:	pivot position can be changed
Option C:	adaptive sorting algorithm
Option D:	can be implemented as a stable sort
Q15.	Which of the following algorithm is not a greedy algorithm
Option A:	Kruskal algorithm
Option B:	Prim's algorithm
Option C:	Huffman coding
Option D:	Bellmen Ford Shortest path algorithm
Q16.	Prim's algorithm is used to find
Option A:	Single source shortest path
Option B:	Minimum spanning tree
Option C:	Traverse the graph
Option D:	All pair shortest path
Q17.	What is the optimal solution for following job sequencing problem: Jobs=J1,J2,J3,J4,J5 Deadline=2,1,3,2,1 Profit=60,100,20,40,20
Option A:	160
Option B:	200
Option C:	180
Option D:	140
Q18.	Which of the following is not an application of dynamic programming?
Option A:	Matrix Chain Multiplication
Option B:	Longest Common Subsequence
Option C:	Travelling Salesman Problem
Option D:	Fractional Knapsack Problem
Q19.	There are 3 items with weights {60,100,120} and values {10, 20, 30}. You are given a knapsack that can carry a maximum weight of 50. What is the maximum value of the items you can carry using the knapsack?
Option A:	160
Option B:	220
Option C:	180
Option D:	120

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Q20.	Which of the following is all pair shortest path algorithm?
Option A:	Dijkstra's algorithm
Option B:	Kruskal's algorithm
Option C:	Floyd-Warshall algorithm
Option D:	Bellman-Ford algorithm

Q2. (20 Marks Each)	Solve any Two Questions out of Three	10 marks each
A	Explain Probabilistic analysis and randomized algorithms	
B	Explain Strassen's matrix multiplication algorithm in detail	
C	Explain divide & Conquer approach. Write a recursive algorithm to sort the array using merge sort	

Q3. (20 Marks Each)	Solve any Two Questions out of Three	10 marks each
A	Explain Prims and Kruskals algorithm with a suitable example	
B	Explain Travelling salesperson problem with a suitable example.	
C	Explain KMP Pattern Matching algorithm with a suitable example.	