PAPER ID-420865

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM VI) THEORY EXAMINATION 2021-22
DESIGN AND ANALYSIS OF ALGORITHM

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If you require any missing data, then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2*10 = 20

Qno	Questions	CO
(a)	Explain the reason behind the call of Heapify procedure only on first half elements of the given array while building a heap.	1
(b)	State the recurrence relation of Tower of Hanoi problem and solve it.	1
(c)	Discuss the properties of Binomial Trees.	2
(d)	Prove that a RB tree with n internal nodes has height atmost 2lg(n+1).	2
(e)	Discuss that why a shortest path cannot contain a cycle?	3
(f)	Differentiate between adjacency list and adjacency matrix representation of graphs.	3
(g)	What is branch and bound technique?	4
(h)	Differentiate between Dynamic Programming and Divide & Conquer approach.	4
(i)	Write down complexity of naïve string matching algorithm.	5
(j)	Differentiate between NP Hard and NP Complete problems.	5

SECTION B

2. Attempt any *three* of the following: 10*3 = 30

Qno	Questions	CO
(a)	Illustrate the working of the counting sort algorithm on array A: {2, 0, 2, 3, 5, 7, 6, 3, 0, 2, 1, 3}.	1
(b)	Show the final tree after inserting the following keys 22, 23, 44, 16, 43, 26, 11, 25, 36, 33, 18, in initially empty R-B tree in same sequence.	2
(c)	Define minimum cost spanning tree. Explain Prim's algorithm for minimum spanning tree of a graph. Also write its Time-Complexity.	3
(d)	Illustrate the concept of backtracking on following sum-of-subset problem, $n = 4$, Sum i.e. $m = 13$, and $wt_1 = 3$, $wt_2 = 4, wt_3 = 5, wt_4 = 7 and\ wt_5 = 8$. by building the search tree.	4
(e)	What is an approximation algorithm? What is meant by P(n) approximation algorithms? Discuss approximation algorithm for vertex cover problem.	5

SECTION C

3. Attempt any *one* part of the following: 10*1 = 10

Qno	Questions	CO
(a)	Write Merge sort algorithm and discuss its time complexity.	1
(b)	Apply quick sort to sort the keys as 12,13,10,5,7,3,2,17,23,16. Also write its algorithm and discuss the running time of the quick sort.	1

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4. Attempt any *one* part of the following: 10 *1 = 10

Qno	Questions	CO
(a)	Illustrate the concept of trie data structure by constructing trie after inserting following strings, "string, sting, streak, steak, stride, step, steep, " in order and then delete "step, streak" in order.	2
(b)	Write the characteristics of a B-Tree of degree t. Create B-Tree of t=3 from the following lists of data items: 20, 30, 35, 85, 10, 55, 60, 25, 5, 65, 70, 75, 15, 40, 50, 90, 45.	2

5. Attempt any *one* part of the following: 10*1 = 10

Qno	Questions	CO
(a)	Define a Knapsack Problem and describe its formulation. Find the optimal solution by using Greedy Method to Knapsack Instance n=5, w=[20,30,40,10,7], P=[700,800,900,100,600] and Capacity (C) of Knapsack is 80.	3
(b)	Show all steps of Strassen's matrix multiplication algorithm using suitable example.	3

6. Attempt any *one* part of the following: 10*1 = 10

Qno	Questions	CO
(a)	Define dynamic programming. How this approach different from recursion? Explain with example.	4
(b)	Design an algorithm based upon dynamic programming for Longest Common Subsequence(LCS) and then calculate LCS of sequence X = <A, B, C, B, D, A, B > and Y=<B, D, C, A, B, A>.	4

7. Attempt any *one* part of the following: 10*1 = 10

Qno	Questions	CO
(a)	Calculate the spurious hits in the text T= 3141592653589793, pattern P = 26 and working modulo q=11, using Rabin-Karp string matching algorithm after writing algorithm for the same.	5
(b)	Demonstrate the concept of FFT (Fast Fourier Transformation) with the help of an example.	5