Exam.Code:0923
Sub. Code: 6849

2021
B. E. (Information Technology)
Fifth Semester
ITE-504: Design of Analysis of Algorithms

Time allowed: 3 Hours Max. Marks: 50

***NOTE**: Attempt <u>five</u> questions in all, including Question No. I which is compulsory and selecting two questions from each Section.*

x-x-x

Q1 Answer the following:

(a) Express the function $n^3/1000 - 100n^2 - 100n + 3$ in terms of Θ-notation. 1
(b) What are the elements of Dynamic Programming. 1
(c) What is the running time of Merge Sort when all elements of array A have the same value? 1
(d) What is the average case and best case complexity of Linear Search? 1
(e) Why using memorization in divide and conquer algorithms does not improve the efficiency? 2
(f) What are recurrences? What are the various methods to solve recurrences? 2
(g) What are non deterministic polynomial time algorithms? 2

SECTION-A

Q2 a) What are asymptotic notations. Why do we use asymptotic notations to specify the complexity of algorithms. Briefly explain the use of various asymptotic notations for representing the complexity of algorithms. 8

b) What is an algorithm? What are the properties of an algorithm. 2

Q3 a) Illustrate the operation of QUICK SORT on the array A = 3, 41, 52, 26, 15, 57, 9, 49. Also give the worst case and best case time complexity of the algorithm. 5

b) Explain the Binary Search using Divide and Conquer Design Strategy. 5

Q4. a) Give a Greedy strategy solution to the knapsack problem that runs in O(n W) time, where n is number of items and W is the maximum weight of items that the thief can put in his knapsack. 5

b) Suppose that the graph G = (V, E) is represented as an adjacency matrix. Give a simple implementation of Prim's algorithm for this case that runs in $O(V^2)$ time. 5

SECTION-B

Q5 a) Explain why memoization is effective in speeding up a good Dynamic programming algorithm such as Multistage Graph . 3

b) Give a dynamic-programming solution to the All pairs shortest path problem. Also, give the performance analysis of the algorithm in terms of time as well as space. 7

Q6 What is Backtracking. Briefly explain how n-Queen's problem can be solved using backtracking along with an example. 10

Q7. Briefly explain the following: 10

a) Reducibility
b) NP Complete Problems
c) NP Hard Problems

x-x-x