Technology

End Term Examination, June 2022

B.Tech, Semester-IV

Course Title: Algorithms and Problem Solving

Course Code: 15B11CI411

Max. Time:2 hours

Max Marks:35

COURSE OUTCOMES		COGNITIVE LEVELS
C214.1	Analyse the complexity of different algorithms using asymptotic analysis	Analyze Level (Level 4)
C214.2	Select an appropriate data structure and apply related operations for a given problem.	Apply Level (Level 3)
C214.3	Apply algorithmic principles for solving a given problem.	Apply Level (Level 3)
C214.4	Identify, formulate and design an efficient solution to a given problem using appropriate data structure and algorithm design technique.	Create Level (Level 6)

1. [CO1] [Marks 4] Form a recurrence relation for the following code and solve it using Master's theorem:

```
a. A(n){
        if (n<=1)
            return log n;
        else
            return √2 A(n/2);}
```

2. [CO3] [Marks 5] Given two strings str1="ABAABA" and str2="BABBAB". Find the maximum length of subsequence as well as the resultant subsequence which is present in both the strings. Strictly use memoization technique to solve the question.

3. [CO4] [Marks 6] There are a set of N computers at JIIT Noida, and a set of M computers at JUET Guna. A connection of the computers from N to M is there, such that the path NM starts at a node in N and ends at a node in M. Formally, you are a given a graph G = (V, E) with a designated subset N ⊆ V and M ⊆V, where N and M are disjoint. The computers in JIIT and JUET have variable transfer capacity. Further, the data transfer rate on NM path is just one. Give an efficient algorithm to find a maximum-capacity of data transfer from N to M. Give the running time of your algorithm, prove that your algorithm is correct, and show that it finds the maximum data transfer capacity of such paths.

4. [CO3] [Marks 5] Apply the cost effective algorithm to find the given pattern from the text.

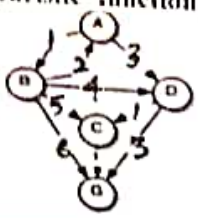
TEXT: ONIONIONSPI

PATTERN: ONIONS

5. [CO4] [Marks 3] *"Satisfiability, 0/1 knapsack, Longest Path these all have something in common i.e. if anyone can solved in polynomial time then all others can be solved as well"*. Derive the relation between satisfiability and 0/1 knapsack algorithm to validate the above statement.

6. [CO3] [Marks 5] A string 'AAAAAA' is stored using a suffix array. A pattern 'AAAAA' is required to be searched in the string. Write all the intermediate steps for finding the offset at which pattern is found. Floor function can be used while calculating the value of mid.

7. [CO4] [Marks 7] Consider the graph shown in Figure. We can search it with a variety of different algorithms (Depth first search, Breadth first search, Uniform cost search, A* search, Best-first greedy search) resulting in different search trees. Each of the trees below was generated by searching this graph, but with a different algorithm. Name that algorithm for each tree (G1 to G7). Assume that children of a node are visited in alphabetical order. Each tree shows all the nodes that have been visited. Numbers next to nodes indicate the relevant "score" used by the algorithm for those nodes. In all cases a strict expanded list was used. Furthermore, if you choose an algorithm that uses a heuristic function, say whether we used H1 or H2.



	H1	H2
A	3	3
B	6	3
C	4	0
D	3	2