JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION-2022

B.Tech-Minor MSCE, VII Semester

COURSE CODE (CREDITS): 18B1WC1743(2) MAX. MARKS: 35

COURSE NAME: ADVANCED ALGORITHMS

COURSE INSTRUCTORS:DIKSHA HOODA MAX. TIME: 2 Hours

***Note:** All questions are compulsory. Marks are indicated against each question in square brackets.*

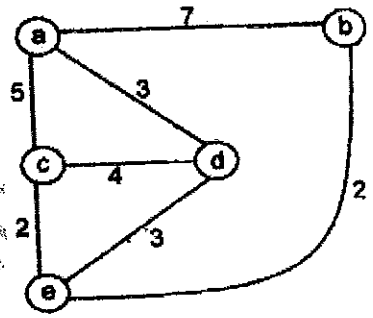
Q1. What is Divide and Conquer Technique? Write an algorithm to search an element in an array using Divide and Conquer approach? **[Marks: 1+2, CO 3]**

Q2. Define Theta Notation (θ) and Big O notation. **[Marks: 2+1.5+1.5, CO 1]**

a) Prove that function f(x) is $\theta(x^4)$, where $f(x) = (5x^4 + 7x + 3)$

b) Prove that running time of T(n) = $(n^3 + 20n + 1)$ is $O(n^3)$

Q3. What is the minimum spanning tree of the below mentioned graph. Show all the intermediate steps for the same **[Marks: 4, CO 2]**



Q4. What is the Dynamic Programming approach? Differentiate between Memoization and Tabulation methods? How does Dynamic Programming help us to reduce the complexity of a problem? **[Marks: 1+2+2, CO 4]**

Q5. Find the Longest Common Subsequence (LCS) for the following strings:

ACACAACTGCACGAC and ACTGGCATG

What would be the complexity of LCS using Dynamic Programming, if both input strings are same? Also, find the complexity if both the strings are completely different. Which of the above two cases, do you think constitute the best case? **[Marks: 3+1+1+1, CO 4]**

Q6. In the below matrix,

a) Find the shortest path from A to any other vertex using Greedy Approach
b) Find the shortest distance of any vertex to any other vertex using Dynamic Programming.

[Marks: 3+5, CO 2,4]

	A	B	C	D	E
B	2	0	45	2	12
D	5	2	12	0	23

Q7. Solve the 0/1 Knapsack problem using Dynamic Programming with the following data:
No. of elements=6
Capacity=8
Elements (weight, benefit): (2,3), (3,4), (2,5), (5,6), (1,10), (4,18). Find out the profit value obtained as the final result of the algorithm along with the table created as part of the approach
[Marks: 4, CO 4]