(3 hours) **(Marks : 80)**

N.B.: (1) Question No. 1 is compulsory.
(2) Attempt any three out of the remaining five questions.
(3) Assumptions made should be clearly stated.

Q1 Answer the following Any Four.

a) What is Complexity? Explain in detail asymptotic notations. **5**
b) Explain approximation algorithms with an example. **5**
c) Compare Greedy approach and Dynamic Programming approach for an algorithm design. **5**
d) Describe naive string matching method. Write the algorithm for the same. **5**
e) Build a max heap for the following. 45, 65, 34, 25, 78, 56, 15. **5**

Q2

a) Define B-tree. Explain insertion and deletion operations on a B tree, with an example of each. **10**
b) Differentiate between Prims and Kruskals algorithms **10**

Q3

a) Find the longest common subsequence for the following two strings, using dynamic programming. X=abcabcba, Y= babcbcab **10**
b) Which are the different methods of solving recurrences. Explain with examples **10**

Q4

a) Consider the instance of knapsack problem where n=6, M=15, profits are (P1,P2,P3,P4,P5,P6) = (1,2,4,4,7,2) and weights are (W1,W2,W3,W4,W5,W6)= (10,5,4,2,7,3). Find maximum profit using Fractional knapsack. **10**
b) Explain matrix chain multiplication in detail. **10**

Q5

a) Sort the following numbers using Quicksort algorithm. 20, 30, 14, 56, 9, 72, 45, 5. **10**
b) Describe, with the help of an example, KMP algorithm. Also, comment on complexity. **10**

Q6.

a) Explain genetic algorithms in detail. **10**
b) Write a note on optimal binary search tree. **10**

(3 Hours) **[Total Marks: 80]**

N.B.: (1) Question No.1 is compulsory.

(2) Attempt **any three** out of remaining questions.

(3) Assume Suitable data if necessary.

(4) **Figures** to the **right** indicate full **marks**.

Q1 a. Differentiate between Greedy method and Dynamic Programming. 5

b. Write an algorithm for finding minimum and maximum number from a given set 5

c. Explain coin changing problem 5

d. Explain Flow Shop Scheduling Technique 5

Q2a. Define AVL tree. Construct an AVL tree for the following data. 10

63, 9, 19, 27, 18, 108, 99, 81

b. Write an algorithm for implementing Quick sort. Also, comment on its complexity. 10

Q3a. What is longest common subsequence problem? Find LCS for the following string: 10

String X: ABCDGH

String Y: AEDFHR

b. Explain Rabin Karp Algorithm in detail. 10

Q4a. Which are the different methods of solving recurrences? Explain with suitable examples. 10

b. Explain Travelling Salesman Problem with an example. 10

Q5a. Explain Huffman Algorithm. Construct a Huffman Tree and find Huffman code for the message: KARNATAKA. 10

b. Explain Knapsack Problem with an example. 10

Q6 Write Short notes on (**any four**) 20

a. Genetic Algorithm
b. Red and Black Tree
c. Merge Sort
d. Knuth Morris Pratt Algorithm
e. Optimal Binary Search Tree (OBST)

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(3 Hours) [Total Marks: 80]

N.B.: (1) Question No.1 is compulsory.

(2) Attempt **any three** out of remaining questions.

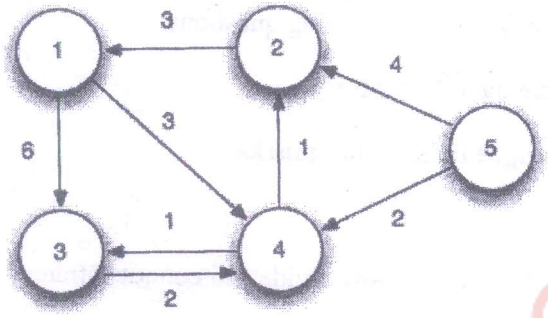
(3) Assume Suitable data if necessary.

(4) **Figures** to the **right** indicate full **marks**.

Q1.	(a)	Explain with example how divide and conquer strategy is used in Binary Search?	5
	(b)	Explain flow shop scheduling technique.	5
	(c)	Write a note on AVL Tree.	5
	(d)	Write an algorithm for finding minimum and maximum number from given set.	5
Q2.	(a)	What is longest common subsequence problem? Find LCS for following string. X=ACBAED Y=ABCABE	10
	(b)	Which are the different methods of solving recurrences? Explain with examples.	10
Q3.	(a)	Compare Greedy and Dynamic Programming approach for an algorithm design. Explain how both can be used to solve knapsack problem.	10
	(b)	Explain Huffman algorithm. Construct Huffman tree for **MAHARASHTRA** with its optimal code.	10
Q4.	(a)	Explain Job sequencing with deadlines. Let n=4,(p1,p2,p3,p4)=(100,10,15,27) and (d1,d2,d3,d4)=(2,1,2,1).Find feasible solution.	10
	(b)	Sort the following numbers using quick sort. Also derive time complexity of quick sort. 27 10 36 18 25 45	10

55912

Q5. (a) Apply all pair shortest path on the following graph 10



(b) Given a chain of four matrices A_1, A_2, A_3 and A_4 with $P_0=5$, $P_1=4$, $P_2=6$, $P_3=2$ and $P_4=7$. Find m[1,4] using matrix chain multiplication 10

Q6. Write Note on **(Any two)** 20

i. Rabin Karp Algorithm.
ii. Topological Sort.
iii. Knuth-Morrie-Pratt algorithm.
iv. Red-Black Tree.

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(3 Hours) [Marks: 80]

N.B.: 1) Question No. 1 is compulsory.
2) Answer any three out of remaining questions.
3) Assume suitable data if necessary.
4) Figures to the right indicate full marks.

Q1. (a) Compute the worst case complexity of the following program segment: (5)

```
void fun(int n, int arr[]){
 int i = 0, j = 0;
for(; i < n; ++i)
while(j < n && arr[i] < arr[j])
j++;
}
```

(b) Differentiate between greedy method and dynamic programming? (5)

(c) . What is the optimal Huffman code for the following set of frequencies, based on the first 8 Fibonacci numbers? (5)

a:1 b:1 c:2 d:3 e:5 f:8 g:13 h:21

(d) Find Longest Common Subsequence for the following: (5)
String x=ACBAED
String y=ABCABE

Q2. (a)Consider the instance of knapsack problem where n=6, M=15, profits are (P1,P2,P3,P4,P5,P6) =(1,2,4,4,7,2) and weights are (W1,W2,W3,W4,W5,W6)=(10,5,4,2,7,3). Find maximum profit using fractional Knapsack. (10)

(b) Explain divide and conquer approach. Write a recursive algorithm to determine the max and min from given elements. (10)

Q3. (a) Define AVL tree. Construct AVL tree for the following data: (10)

21,26,30,9,4,14,28,18,15,10,2,3,7

(b) A traveler needs to visit all the cities from a list (figure 1), where distances between all the cities are known and each city should be visited just once. What is the shortest possible route that he visits each city exactly once and returns to the origin city? (10)

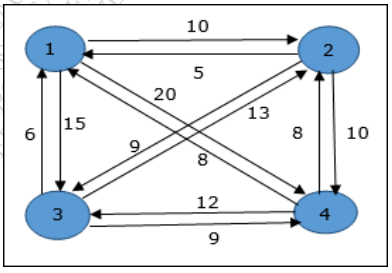

Figure 1.

Q4. (a) Construct a minimum spanning tree shown in figure 2 using Kruskal's and Prim's Algorithm and find out the cost with all intermediate steps. (10)

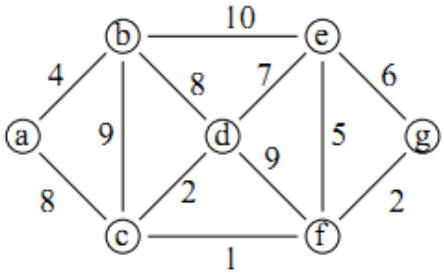

Figure 2

(b) What is optimal binary search tree? Explain with the help of example. (10)

Q5. (a) Give asymptotic upper bound for T(n) for the following recurrences and verify your answer using Masters theorem:

$$T(n) = T(n-1) + n$$ (10)

(b) Given a set of 9 jobs (J1,J2,J3,J4,J5,J6,J7,J8,J9) where each job has a deadline (5,4,3,3,4,5,2,3,7) and profit (85,25,16,40,55,19,92,80,15) associated to it .Each job takes 1 unit of time to complete and only one job can be scheduled at a time. We earn the profit if and only if the job is completed by its deadline. The task is to find the maximum profit and the number of jobs done. (10)

Q6. Explain any Two: (20)

a) Rabin Karp Algorithm
b) Genetic Algorithm
c) Minimum Cost Spanning Tree
d) Red Black Trees

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