

M.E. / M.TECH. DEGREE EXAMINATIONS, DEC 2020 (Held during April, 2021)

First Semester

CP18101-Advanced Data Structures & Algorithms

Common to CS & NW

(Regulation 2018)

Time: Three hours

Maximum: 80 Marks

Answer ALL questions

PART A - (8 X 2 = 16 marks)

1. The time complexity of $n!$ is
a) $\text{Big } \omega(1)$ b) $\text{Big } \omega(n^2)$ c) $\text{Big } \omega(n \log n)$ d) $O(\log n)$
2. In which algorithm searching is performed effectively
a) AVL tree b) Red and black tree c) Binary search tree d) Splay tree
3. Which algorithm is used to find transitive closure of a graph in $\Theta(N^3)$ time?
a) Floyd Warshall Algorithm b) Dijkstra's algorithm c) Bellman ford algorithm d) Johnson's algorithm.
4. Consider the strings "PQRSTPQRS" and "PRATPBRQRPS". What is the length of the longest common subsequence?
a) 8 b) 9 c) 7 d) 6
5.

```
j=1;
while (j<=n/2)
{
i=1;
while(i<=j)
{
cout<<j<<i;
i++;
}
j++;
}
```

Identify the time complexity of the above code.
6. What is the time complexity of the binary search tree? a) if the tree is scattered b) if the tree is skewed towards left or right .
7. Brief on how principle of optimality is applied to solve All Pair Shortest path problem.
8. When a problem is said to be NP-complete? Justify your answer.

PART B - (4 X 16 = 64 marks)

09. (a) (i) Write an algorithm to sort out the given numbers 17,21,15,16,18,20,19 with $O(n)$ (16) time complexity and derive its average case analysis.

(OR)

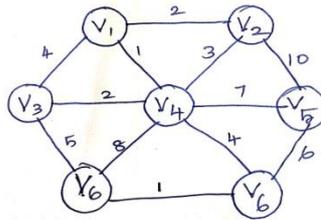
- (b) (i) Write an recursive algorithm to find sum of digits in a number and find its time (16) complexity using tree and substitution method.

10. (a) Create a Red Black tree using the keys 10, 85, 15, 70, 20, 60, 30, 50, 65, 80, 90, 40, 5, 55 (16)

(OR)

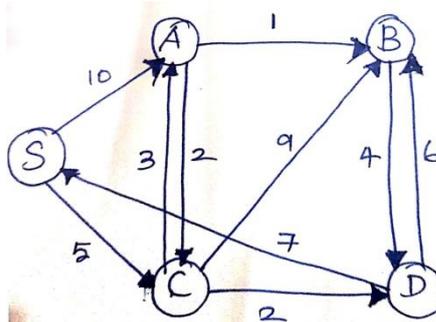
- (b) Create a Max Heap and Min Heap using the keys 27,17,3,16,13,10,1,5,7,12,4,8,9,0 (16)

11. (a) Write Prim's and Kruskal algorithms to find the MST for a graph. Apply Prim's and Kruskal algorithms to find the MST for the below graph. (16)



(OR)

- (b) (i) Apply Dijkstra's algorithm to the below graph considering S as source vertex to find the shortest path from S to all other vertices. (16)



12. (a) Write an effective algorithm to solve Matrix Chain Multiplication and apply it to solve the instance A:30x35; B:35x15; C:15x5; D:5x10 ;E:10x20; F:20x25 (16)

(OR)

- (b) Write an effective algorithm to find the longest common sub-sequence among two strings X and Y of lengths M and N respectively. Apply your algorithm to the instance X:<A,C,B,D,E,A> Y:<A,B,C,D,A> (16)