



HALDIA INSTITUTE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION UNDER MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL)

Paper Code: MCS-PC 201

Paper Name: Advanced Algorithm

Time Allotted: 3 Hours

Full Marks: 70

The figures in the margin indicate full marks

Candidates are required to give their answers in their own words as far as practicable

Group – A

(Multiple Choice Type Questions)

Choose the correct alternatives from the followings:

10x1=10

1.(i) Bellman Ford Algorithm is an example of

- a) Dynamic Programming
- b) Greedy algorithms
- c) Linear Programming
- d) Branch and Bound

(ii) What is the worst case time complexity of merge sort?

- a) $O(N \log N)$
- b) $O(n^*n)$
- c) $O(\log N)$
- d) $O(\log \log N)$

(iii) Root order traversal is

- a) DFS
- b) BFS
- c) Both a and b
- d) None of these

(iv) Which of the following algorithm can be used to find single source shortest path of a graph containing negative weight cycles?

- a) Bellman-Ford
- b) Dijkstra
- c) Floyd-Warshall
- d) Prim

(v) Kruskal's algorithm uses in determining the Minimum Spanning Tree.

- a) edges
- b) vertex
- c) Both (a) & (b)
- d) None of these

(vi) Maximum number of spanning trees in a complete graph of 4 nodes is

- a) 10
- b) 12
- c) 14
- d) 16

(vii) Time complexity of matrix chain multiplication

- a) $O(n^2)$
- b) $O(n)$
- c) $O(n \log n)$
- d) $O(n^3)$

(viii) DFS on a graph $G = (V, E)$ has running time

- a) $O(|V| + |E|)$
- b) $O(|V|)$
- c) $O(|E|)$
- d) None of these

(ix) Among all other algorithmic approaches, simplest and straightforward approach is

- a) Dynamic
- b) Greedy
- c) Divide and Conquer
- d) Backtracking

(x) What is the recurrence relation used in Strassen's algorithm?

- a) $7T(n/2) + \theta(n^2)$
- b) $8T(n/2) + \theta(n^2)$
- c) $7T(n/2) + O(n^2)$
- d) $8T(n/2) + O(n^2)$

Group – B

(Long Answer Type Questions)

5x12=60

Attempt any five from the followings:

2. i) Derive the complexity of the following recurrence relation using Master Theorem:

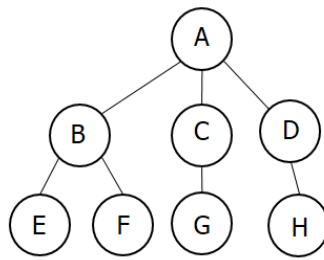
6

Assume $T(1)=1$

$T(n)=T(n/2)+4, n \geq 2$

ii) Prove $3n^2+4n-2=O(n^2)$ 6

3. Traverse the following graph using DFS 12



4. i) Explain spanning tree with example. 6

ii) Explain fractional knapsack with example. 6

5. i) Determine the inverse of the following upper triangular matrix 6

$$A = \begin{bmatrix} 2 & 5 \\ 0 & 3 \end{bmatrix}$$

ii) Determine the complexity of Strassen's matrix multiplication. 6

6. Find interpolating polynomial $f(x)$ satisfying 12

$f(0)=0, f(2)=4, f(4)=56, f(6)=204, f(8)=496, f(10)=980$. Find $f(3), f(5)$.

7.i) Explain the concept of Co-NP problem. 6

ii) Write short note on P Class of problems. 6

8. Solve following equations using Chinese Remainder Theorem 12

$$X \equiv 2 \pmod{3}$$

$$X \equiv 3 \pmod{5}$$

$$X \equiv 2 \pmod{7}$$