ADA important questions

Computer Science (Rajiv Gandhi Proudyogiki Vishwavidyalaya)

Unit I

Algorithms, Designing algorithms, analyzing algorithms, asymptotic notations, heap and heap sort. Introduction to divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, merge sort, quick sort, strassen's matrix multiplication.

Q1. Discuss the criteria of algorithms.
Q2. Why do we use asymptotic notation in the study of algorithm? Briefly describe the commonly used asymptotic notation?
Q3. Explain how various structure are analyzed? Give examples.
Q4. What is recursion? Write a recursive algorithm to generate Fibonacci sequence?
Q5. What is divide-and-conquer technique? What is strassen's algorithm for multiplication?
Q6. Explain how to apply the divide and conquer strategy for Binary search algorithm?
Q7. Write iterative and Recursive algorithm of binary search process.
Q8. What are the two phase in heap sort algorithm? Sort the following data using heap sort and show all the intermediate steps: 88, 12, 91, 23,10, 36, 45, 55, 15, 39, 81
Q9. Sort the given list using merge sort 70, 80, 40, 50, 60, 12, 35, 95, 10.
Q10. Show how procedure QUICKSORT sorts the following set of keys? A= {5 7 9 4 10 2 8 1}
Q11. What is Feasible solution
Q12. Difference between Divide & conquer and Greedy Method.

Q13. Apply Merge sort Algorithm for the for the following array and sort the element. 24, 56, 47, 35, 10, 90, 82, 31. Also discuss complexity of Algorithm
Q14. Define Algorithm .Discuss how to analyze algorithm?
Q15. Explain how to apply the divide and conquer strategy for sorting the elements using quick sort?
Q16. What do understand by priori and posteriori analysis?
Q17. What is difference between debugging and profiling?
Q18. Explain the Masters Method with example?
Q19. What are different asymptotic notations used? Explain.
Q20. Solve the recurrence relation T(n)= 3(n/4)+n
Q21. Show that solution of T (n) =T (n/2) +1 is O (log n)
Q22. Find Time Complexity

a)
```
A( )
{
  i = 1 ; s = 1 ;
  while(s <=n)
 {
  i++;
  s = s + i ;
```

b)
```
A( )
{
  for( i = 1 ; i < n ; i = i *3)
  pf("College");
}
```

pf (“Gyan Ganga “); } } Ans: O(under root n)	Ans: $O(\log_3 n)$

Q23. Write an algorithm for merge sort and find the complexity (Time and Space) of merge sort ?
merge sort-- time O(nlogn) ; space O(n)
Quicksort- Time best O(nlogn) worst $O(n^2)$; space best O(logn) worst O(n)
Q24. Define Asymptotic Notation With Example?
Q25. $T(n) = 4T(n/2) + Cn$ Ans: $O(n^2)$
Q26. $T(n) = 3T(n/4) + n\log n$ Ans: $O(n \log n)$

Unit II

Study of Greedy strategy, examples of greedy method like optimal merge patterns, Huffman coding, minimum spanning trees, knapsack problem, job sequencing with deadlines, single source shortest path algorithm

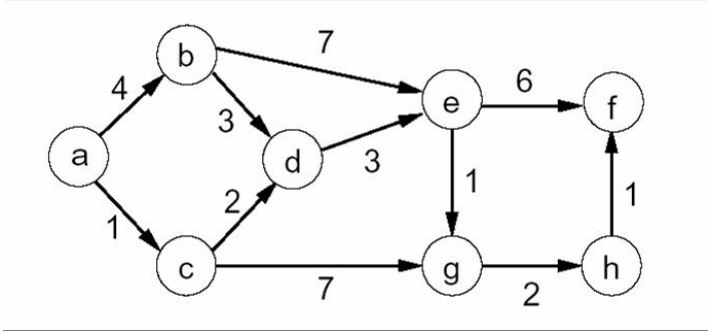
Q1. What is Greedy strategy draw the algorithm and complexity?
Q2. Explain Job sequencing with dead line with example.
Q3. Define the optimal Merge pattern with Huffman code for different files (q1,q2,...q7) = (4,5,7,8,10,12,20).

Q4. Explain Greedy Strategy for sequencing unit times Job with deadlines and profits .Find the Optimal solutions where n=5

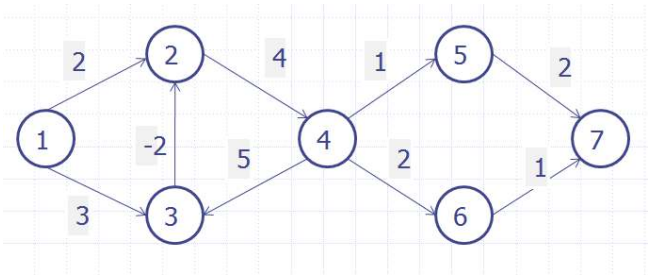
Job	**Profit**	**DeadLine**
P1	20	2
P2	15	2
P3	10	1
P4	5	3
P5	1	3

Q5. Explain Huffman Code with algorithm.

Q6. Find out MST using prim’s algorithm in following graph.



Q7.Solve single source shortest path for given graph



Unit III

Concept of dynamic programming, problems based on this approach such as 0/1 knapsack, multistage graph, reliability design, Floyd-Warshall algorithm .

Q1. Explain the concept of Dynamic Programming?
Q2. Explain Multistage? Discuss its Application?
Q3. Describe reliability design with Example.
Q4. Explain Warshall Algorithm with suitable Example.
Q5. Using Floyd Warshall Algorithm solve the all pair shortest path problem for the graph. Where weight matrix is given below :-

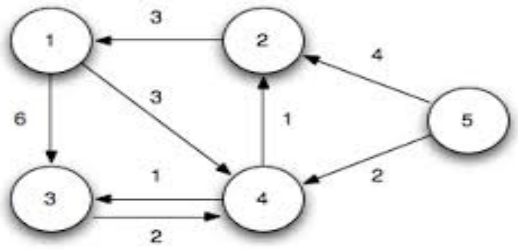
Q6. Solve knapsack problem in three objects, 20 capacity and profit (25,24,15) weight (18,15,10).
Q7. Solve the following 0/1 Knapsack Problem using Dynamic Programming . The Capacity of Knapsack W is 10?

Item	1	2	3	4
Weight	4	7	5	3
Value	40	42	25	12

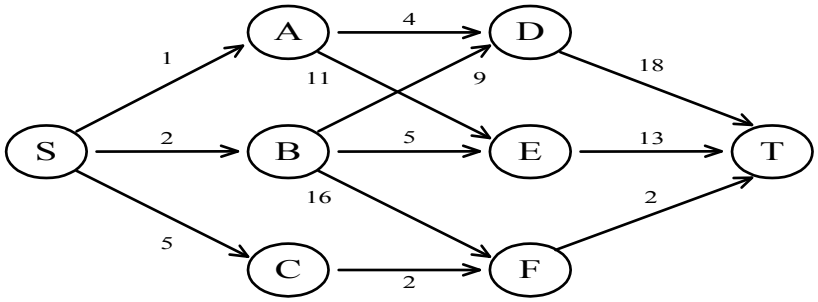
Q8. Find optimal solution for 0/1 knapsack problem (w1,w2,w3,w4)=(10,15,6,9), (p1,p2,p3,p4)=(2,5,8,1) and M=30.

Q9. Find the shortest path from vertex 1 to vertex 5 in the following weighted graph using Dijkstra's greedy algorithm.

5



Q10. Find a minimum cost path from's' to't' in multistage graph using dynamic programming using backward approach.



Unit IV

Backtracking concept and its examples like 8 queen's problem, Hamiltonian cycle, Graph coloring problem etc. Introduction to branch & bound method, examples of branch and bound method like traveling salesman problem etc. Meaning of lower bound theory and its use in solving algebraic problem, introduction to parallel algorithms.

Q1.What is Backtracking? Find the solution to the 4-Queen problem using backtracking strategy?

Q2. What do you understand by Hamiltonian cycles? Write an algorithm to find all Hamiltonian cycles in a given graph using backtracking and determine the complexity also.

Q3. Explain parallel algorithm?

Q4. Explain Graph Coloring problem with their complexity?

Q5. Define Branch and Bound Method?

Q6. Consider the traveling salesperson instance defined by the cost matrix. Obtain the reduced cost matrix and solve it

∝	20	30	10	11
15	∝	16	4	2
3	5	∝	2	4
19	6	18	∝	3
16	4	7	16	∝

Unit V

Binary search trees, height balanced trees, 2-3 trees, B-trees, basic search and traversal techniques for trees and graphs (In order, preorder, postorder, DFS, BFS), NP-completeness.

Q1. Apply Binary search to find 123 in a list 45, 96, 105, 121, 145, 192, 199, 205, 245, 275, 123, 850, 905

Q2. What is 2-3 trees? Write characteristic of 2-3 trees?

Q3. Explain the meaning of Lower Bound Theory with example?

Q4. Explain N, NP, NP hard and NP Complete classes in brief?

Q5. Discuss the relationship between class P,NP,NP-complete and NP-hard problems with suitable example of each class?

Q6. Following nodes are inserted in empty tree to form minimum heap with neat sketches show how insertion will be done 8, 7, 11, 6, 2, 1, 5, 12.

Q7.Find the optimal binary merge tree (pattern) for ten files whose length are 28, 32, 12, 5, 84, 53, 91, 35, 3 and 11. Also find its weighted external path length.

Q8. Construct an AVL tree for the following list {5, 6, 8, 3, 2, 4, 7} by inserting the elements successively, starting with empty tree.

Q10.Construct a B-tree of order of 5 elements 1 7 6 11 4 8 13 10 5 19 9 18 24 3 12 14 20 21 16 and delete 8 18 16 4?