SRINIX COLLEGE OF ENGINEERING, BALASORE

DEPARTMENT OF
COMPUTER SCIENCE & ENGINEERING

ASSIGNMENT ON

DESIGN AND ANALYSIS OF ALGORITHIM

DESIGN AND ANALYSIS OF ALGORITHIM QUESTION BANK

Assignment-1

1. Explain different Characteristics of Algorithm?
2. Why Correctness of the Algorithm is essential?
3. Explain iterative Algorithm Design Issues?
4. Explain different means of improving efficiency of Algorithm?
5. Write short note on Algorithm as a technology?
6. Write short note on Evolution of algorithm?
7. What are the general rules followed while writing the algorithm?
8. How to confirm correctness of algorithm? explain with example?
9. Explain the concept of PMI and prove the correctness of an algorithm to find factorial of a number using PMI
10. Contrast and compare between iterative and recursive process with an example?
11. Explain the importance of algorithm in computing with example?
12. Explain the various algorithm design methodology to solve a problem?
13. Explain Big O,Omega and Theta notations?Explain what are they used for?
14. How do we analyze algorithms? Explain what is meant by space and time complexity?
15. Discuss different ways of algorithm design with suitable example?

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Assignment-2

1. Write and explain Huffman Code Generation Algorithm?
2. Give a linear time algorithm for fractional knapsack problem?
3. Solve the following using Huffman's code generation algorithm

Symbol	Probability
a	0.12
b	0.04
c	0.45
d	0.16
e	0.23

4. Which are the features of Functional model?
5. Explain recursive processes with example.
6. Explain Tail recursion with suitable example?
7. Explain the importance of Tail recursion with a suitable example?
8. Differentiate between O(1) and O(n)? Is algorithm performance depends on input size (True/False) Justify your answer with suitable example?
9. Write an algorithm to check a number is prime or not by using step refinement process, also prove the correctness of the algorithm?
10. What is an optimal Huffman code for the following set of frequencies
11. a : 1, b:1, c:2, d:3, e:5, f:8,g:13,h : 21
12. Write an algorithm for Bubble sort and find its time complexit
13. What are the applications of greedy strategy? Explain the concept of optimal solution?
14. Explain the concept of scheduling algorithm. Calculate the total profit for the following problem using Greedy approach Tasks given (T1…….T9). Deadline (7, 2, 5, 3, 4, 5, 2, 7, 3) and Profit (15, 20, 30, 18, 18, 10, 23, 16, 25) respectively.
15. Using Greedy approach for the instances of knapsack of item ,n=3 & capacity ,m=20 and having Profit (P1,P2, P3) =(25, 24, 15) & weight (W1, W2, W3) = (18, 15, 10) . Find out the Optimal Solution.
16. Greedy approach- consider the following instances of knapsack problem n=5, w=100, W (10, 20, 30, 40, 50) , V(20, 30, 66, 40, 60), find the optimal solution.

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Assignment-3

1. Explain elements of Dynamic programming.
2. Explain the Knapsack problem using mathematical notations. Solve the, above Knapsack problem using Greedy approach. to get optimal solution with maximum profit Items given(I1, I2, I3, I4, I5,) Profit (10, 20,5, 7,8) Weight (5, 6, 7,8,10) . Max weight = 15.
3. Design a linear time algorithm for solving fractional Knapsack problem. Prove that the time complexity of presented algorithm is indeed linear.
4. Explain the concept of control abstraction in Dynamic Programming. What is the use of memorization table.
5. Find an optimal solution for following 0/1 knapsack problem using dynamic programming ,Number of objects n=4, Knapsack capacity M=5, Weights (w1,w2,w3,w4)=(2,3,4,5) & Profit (p1,p2,p3,p4)= (3,4,5,6) [6 Marks]
7. Consider N=3, (w1,w2,w3) = (2,3,3), (p1,p2,p3) = (1,2,4) and M = 6. Solve 0/1 Knapsack Problem.
   6. Write short notes on (Any Two) (each carry equal marks)
   a. Genetic Algorithm
   b. Artificial Neural Network
   c. Write short notes on (Any Two) (each carry equal marks)
   d. Evolutionary Computing
   e. Simulated Annealing.
   f. Tabu Search.
7. Draw a neat architecture of Artificial Neural Network. Explain the importance of weight, bias and target output.
8. Explain Genetic Algorithms with an example.
9. Solve multiplication using Divide and Conquer strategy 12345678 * 21394276
10. Consider the chain matrix A1,A2 & A3 with dimensions given below. Give the optimal parentheses to get the product.
    a. Matrix Dimension sA1 5 X 10
    b. A2 10 X 20
    c. A3 20 X 25
11. Find minimum distance path from vertex 1 to 7 using dijkstra's algorithm
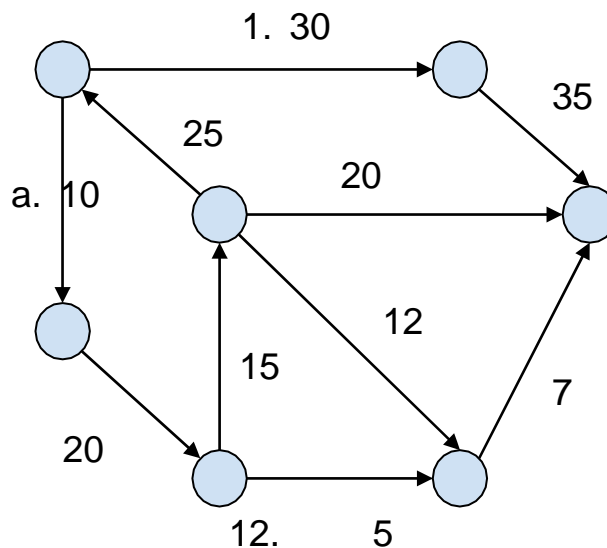
13. Write an algorithm to compute the shortest distance between the source and destination vertices of a connected graph? Will this algorithm work for negative weights?

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Assignment-4

8. Prove that vertex cover problem is NP-complete.
9. Differentiate between (Any Two) (each carry equal marks)
10. deterministic and non deterministic algorithms
11. P class and NP class problem
12. polynomial and non deterministic polynomial
13. Show that job sequencing problem is NP hard
14. Explain NP and NP-hard problems
15. What is satisfiability problem
16. What is sat and 3-sat problem ? Prove that 3-sat problem is np complete
17. Define P , NP, NP-hard, NP-complete.
18. State and explain NP hard (Any Two) (each carry equal marks)
19. Hamilton cycle
20. Scheduling problem
21. What is NP complete problem? Explain steps to prove that problem is NP-complete.
22. Explain vertex cover problem with example.
23. Explain polynomial reduction problem.
24. Find the upper and lower bound for quick sort algorithm.
25. Define Asymptotic Notations? Explain their significance in analyzing algorithms?
26. Explain deterministic and non-deterministic Algorithms.
27. Explain Class NP-Hard? Differentiate between NP-Hard & NP-Complete algorithms?

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Assignment-5

1. What is amortised analysis? List different methods to do the same.
2. Explain Amortized analysis. Explain Binary heap, Binomial heap and Fibonacci heap
3. Discuss aggregate method for amortised analysis.
4. Discuss amortised analysis operations on stack and counter.
5. Do aggregate time complexity analysis for implementing K-bit binary counter.
6. Discuss the accounting method for amortised analysis.Discuss it with operations on stack and counter.
7. Discuss the potential method for amortised analysis. Discuss it with operations on stack and counter.

8. Explain binary heap algorithm with its complexity analysis.
9. Explain various heap operations.
10. Explain Dijkstra's algorithm with its complexity Dis
11. Write a short note on time-space trade-off.
12. Write a short note on randomised algorithms.
13. Write & Explain sorting algorithm for embedded systems and state its time complexity?
14. What is embedded system? Explain embedded system scheduling algorithms.
15. Write a short note on splay trees.

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Assignment-6

1. Explain multithreaded algorithms.
2. Analyze multithreaded algorithms with suitable examples?
3. Write a note on dynamic multithreading.
4. Explain the performance measures: work, span, speedup, parallelism and slackness.
5. Write the analysis of multithreaded algorithms with an example.
6. Explain the concept of parallel loops.
7. What are race conditions in multithreaded algorithms? Explain in detail.
8. Write and explain the algorithm for multithreaded matrix multiplication.
9. Write and explain the algorithm for multithreaded merge sort.
10. What are distributed algorithms?
11. Explain distributed breadth first search algorithm for 1D partitioning.
12. Explain distributed breadth first search algorithm for 2D partitioning.
13. Write a short note on distributed breadth first search algorithm?
14. What is string matching? Explain with example.
15. Write a detailed note on Rabin Karp String matching algorithm and discuss its complexity.