

Marathwada Institute of Technology
Master of Computer Application
Title of the subject: Design Analysis and Algorithm
Course Code: MCA 206

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Class: SYMCA-A SEM II

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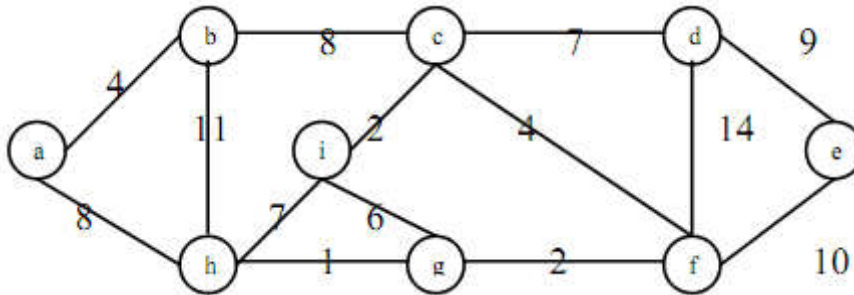
Note: The students should complete and submit the following set of assignments on 08th April 2013.

- 1 Explain primitive and non primitive data structures
- 2 Define stack. Write algorithm for inserting and deleting elements in stack.
- 3 Define queue. Write algorithm for inserting and deleting elements in queue.
- 4 Explain circular queue
- 5 Explain with the help of example linked list
- 6 Define algorithm and write algorithm Specification.
- 7 Write algorithm for finding the factorial of n numbers.
- 8 Explain recursive algorithm with the help of example
- 9 On what basis the performance of an algorithm is based on? What are the two major phases of performance evaluation?
- 10 What is the space components needed for any algorithm?
- 11 What is program space?
- 12 What are the two ways of program step count? Explain with the help of example.
- 13 What are the reasons for managing space complexity and understanding the need for time complexity?
- 14 What three types of cases do we investigate in complexity theory?
- 15 Explain the various criteria used for analyzing algorithms.
- 16 Describe briefly the notations of complexity of an algorithm.

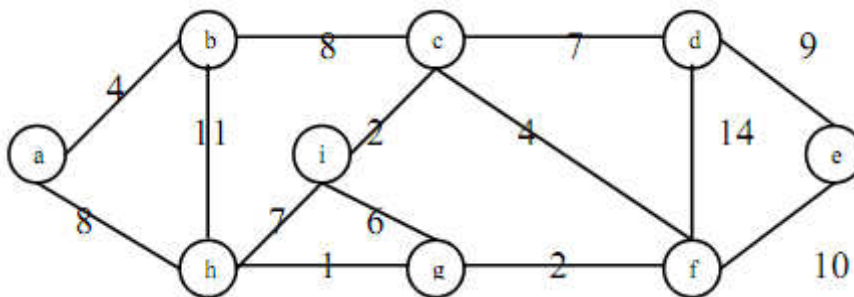
- 17 List the properties of various asymptotic notations
- 18 Define the following terms:
 1. Binary tree
 2. Complete binary tree
 3. Heap
- 19 Heap sort the following elements:

5 3 1 9 8 2 4 7
- 20 What is Hashing? Explain with example:
 1. Linear probing
 2. Quadratic probing
- 21 Consider the case of regular multiplication of x and y (assume x and y as 8 bit numbers) and explain the concept of divide and conquer?
- 22 Give the recurrence relation for divide & conquer.
- 23 Write a recursive algorithm for solving Tower of Hanoi problem
- 24 Write a divide and conquer algorithm for Binary search and compute its complexity.
- 25 Quick sort the following:
38 81 22 48 13 69 93 14 45 58 79 72
- 26 Write divide and conquer algorithm for quick sort.
- 27 Using divide and conquer merge sort the following
310 285 179 652 351 423 861 254 450 520
- 28 Write recursive algorithm for divide and conquer merge sort
- 29 Compute the complexity for divide and conquer merge sort algorithm
- 30 Write a simple algorithm for finding minimum and maximum from a given set of numbers.
- 31 Write recursive algorithm using divide and conquer strategy for finding minimum and maximum from a given set of numbers.
- 32 Compute the complexity of the algorithm in q.no.30 and 31 and compare the efficiency of the two.

- 33 Suppose an array A contains 8 elements as follows:
 77 33 44 11 88 22 66 55
 Sort it using selection sort.
- 34 Write algorithm for selection sort.
- 35 What is a feasible solution and what is an optimal solution?
- 36 Explain Greedy method and discuss some problems which are solved using this algorithm.
- 37 What are minimum spanning trees? Write and explain any algorithm to find a minimum spanning tree for a given graph.
- 38 Find the minimum spanning tree for the following graph using Kruskal's algorithm



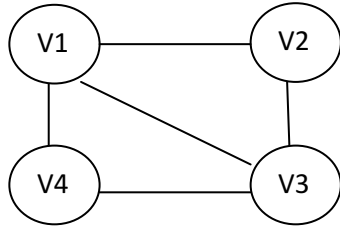
- 39 Find the minimum spanning tree for the following graph using Prim's algorithm



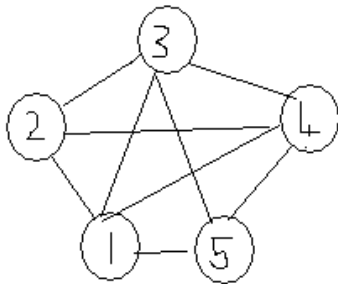
- 40 What is knapsack problem and what are its types?
- 41 Write an algorithm to solve a knapsack problem and hand run the algorithm for the following example:
 Example: Find an optimal solution to the knapsack instance $n=3$, $m=20$,
 $(p_1, p_2, p_3) = (25, 24, 15)$ and $(w_1, w_2, w_3) = (18, 15, 10)$

- 42 Find an optimal solution to the knapsack instance $n=7$, $m=15$
 $(p_1, p_2, \dots, p_7) = (10, 5, 15, 7, 6, 18, 3)$ and $(w_1, w_2, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$
Solve it using the following greedy approach:
 1. By profit density
 2. By weight
 3. By profit
- 43 With the help of example explain job sequencing with deadlines
- 44 Explain Dijkstra's algorithm for shortest path from a single source.
- 45 State if backtracking always produces optimal solution.
- 46 Define backtracking.
- 47 What are the two types of constraints used in backtracking?
- 48 What is meant by optimization problem?
- 49 Define Hamiltonian circuit problem.
- 50 What is Hamiltonian cycle in an undirected graph?
- 51 Define 8-queens problem.
- 52 List out the application of backtracking.
- 53 Define promising node and non-promising node.
- 54 Give the explicit and implicit constraint for 8-queen problem.
- 55 What is state space tree?
- 56 Explain the sum of subset problem with example using state space tree.
- 57 Draw a pruned state space tree where back tracking is used with $n=4$, $W=13$ and $w_1=3, w_2=4, w_3=5, w_4=6$.
- 58 Write an algorithm for 8-queens problem.
- 59 Draw a state space tree for 4-queen problem.
- 60 What is graph coloring problem?

- 61 What is the chromatic number for coloring the following graph? Draw the state space tree showing node color satisfying the graph coloring problem.



- 62 Explain the concept of branch and bound.
- 63 What is the difference between backtracking and branch and bound?
- 64 Find the solution to the following travelling salesman problem using branch and bound. Derive the solution using state space tree.



-	10	8	9	7
10	-	10	5	6
8	10	-	8	9
9	5	8	-	6
7	6	9	6	-

- 65 Solve the following instance of the knapsack problem by the branch and bound algorithm.

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

The Knapsack's capacity $W=10$

- 66 Solve the following instance of the knapsack problem by the branch and bound algorithm.

Item	Weight	Value
1	10	100
2	7	63
3	8	56
4	4	12

The Knapsack's capacity $W=16$

- 67 What is the tree vertex splitting problem? Solve the following tree vertex splitting problem for $\delta = 10$

