



BRAINWARE UNIVERSITY
Term End Examination 2020 - 21
Programme – Master of Computer Applications
Course Name – Algorithm Analysis
Course Code - MCA302

Semester / Year - Semester III

Time allotted : 85 Minutes

Full Marks : 70

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 70=70

1. *(Answer any Seventy)*

(i)

Complexity the recurrence relation $T(n) = 8T(n/2) + n^2$

- | | |
|------------------|-------------|
| a) $O(n)$ | b) $O(n^2)$ |
| c) $O(\log_2 n)$ | d) $O(n^3)$ |

(ii) Complexity of Tower of Hanoi problem is

- | | |
|-------------|------------------|
| a) $O(n)$ | b) $O(n^2)$ |
| c) $O(2^n)$ | d) None of these |

(iii) There are _____ steps to solve the problem

- | | |
|----------|---------|
| a) Seven | b) Four |
| c) Six | d) Two |

(iv) The complexity of searching an element from a set of n elements using Binary search algorithm is

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

$O(n^2)$

(v) Which case of Master's theorem is applicable in the recurrence relation $T(n)=0.5*T(n/2)+1/n$?

- a) Case 3
- b) Case 1
- c) Master's theorem is not applicable
- d) Case 2

(vi) The worst-case time complexity of Bubble Sort is_____.

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

$O(n^2)$

- c) $O(n)$
- d) $O(n \log n)$

(vii) How many cases are there under Master's theorem?

- a) 2
- b) 3
- c) 4
- d) 5

(viii) What is the objective of tower of Hanoi puzzle?

- a) To move all disks to some other rod by following rules
- b) To divide the disks equally among the three rods by following rules
- c) To move all disks to some other rod in random order
- d) To divide the disks equally among three rods in random order

(ix) Minimum number of moves required to solve a tower of Hanoi problem with n disks is _____

- a) 2^n
- b) 2^n-1
- c) 2^n
- d) 2^n-1

$$n^2$$

$$n^2-1$$

(x) Two main measures for the efficiency of an algorithm are

- a) Processor and memory
- b) Complexity and capacity
- c) Time and space
- d) Data and space

(xi) The time factor when determining the efficiency of algorithm is measured by

- a) Counting microseconds
- b) Counting the number of key operations
- c) Counting the number of statements
- d) Counting the kilobytes of algorithm

(xii) ? - notation provides an asymptotic

- a) Upper bound
- b) Lower bound
- c) One that is sandwiched between the two bounds
- d) None of these

(xiii)

The time complexity of the expression $f(n) = 6 \cdot 2^n + n^7$ using big-O notation is

- a) $O(2^n)$
- b) $O(n^7)$
- c) $O(n)$
- d) $O(n \log_2 n)$

(xiv) The operation of processing each element in the list is known as

- a) Sorting
- b) Merging
- c) Inserting
- d) Traversal

(xv) Which of the following algorithm design techniques is used in the quick sort algorithm?

- a) Dynamic Programming
- b) Backtracking
- c) Divide and conquer
- d) greedy method

(xvi) Which of the following approaches is adopted in Divide and Conquer algorithms?

- a) Top-down
- b) Bottom-up
- c) Both Top-down & Bottom-up
- d) none of these

(xvii) Which of the following design techniques is used in the heap-sort algorithm?

- a) Dynamic programming
- b) Backtracking
- c) greedy method
- d) Divide and conquer

(xviii) Divide and conquer strategy is used in which of the following algorithms?

- a) Merge sort and Selection sort
- b) Quick sort and Computation of x^n
- c) Both Merge sort and Selection sort & Quick sort and Computation of x^n
- d) none of these

(xix) The worst-case time complexity of Quick Sort is_____.

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

(xx) Recursive solution of tower of Hanoi problem is an example of which of the following algorithm?

- a) Dynamic programming
- b) Backtracking
- c) Greedy algorithm
- d) Divide and conquer

(xxi) The tight bound for building a max heap is

a) $O(n)$

b)

$O(\log_2 n)$

c)

d) None of these

$O(n \log_2 n)$

(xxii) Which one of the following sorting algorithms is best suited to sort an array of 1 million elements?

a) Bubble sort

b) Insertion sort

c) Merge sort

d) Quick sort

(xxiii) Quick sort is a space-optimized version of _____

a) Bubble sort

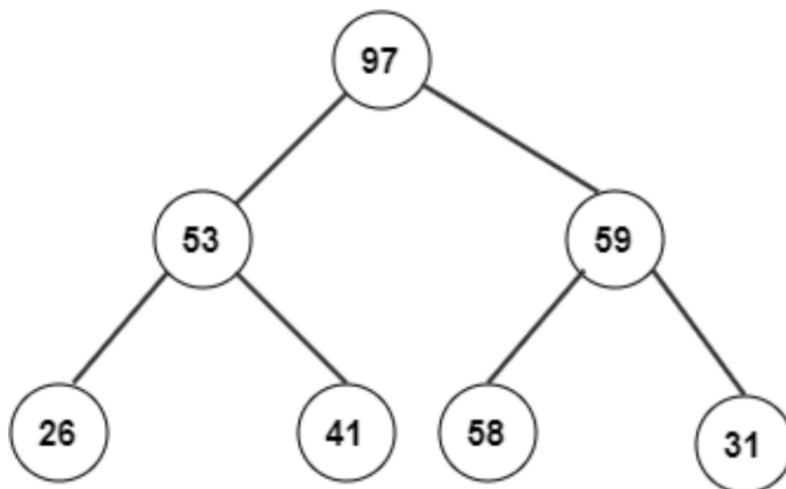
b) Selection sort

c) Insertion sort

d) Binary tree sort

(xxiv)

Consider the following heap after build heap phase. What will be its corresponding array?



a) 26,53,41,97,58,59,31

b) 26,31,41,53,58,59,97

c) 26,41,53,97,31,58,59

d) 97,53,59,26,41,58,31

(xxv) What is the depth of any tree if the union operation is performed by height?

a) $O(N)$

b) $O(\log N)$

c) $O(N \log N)$

d) $O(M \log N)$

(xxvi) Disjoint set data structure applicable to find

a) Minimum spanning tree

b) Minimum shortest path

c) Maximum spanning tree

d) Maximum path

(xxvii) Select the algorithm which is not followed Dynamic Programming

a) 0/1 Knapsack Problem

b) Matrix Chain Multiplication

c) All Pair Shortest Path - Floyd Warshall Algorithm

d) Job sequencing with deadline

(xxviii) What is the time complexity of Kruskal's algorithm?

a) $O(\log V)$

b) $O(E \log V)$

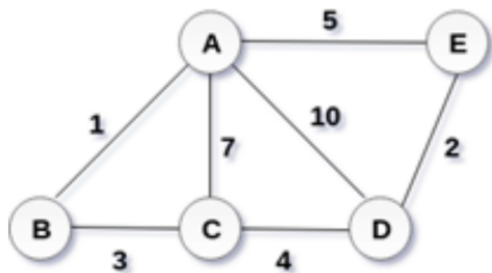
c)

d) $O(V \log E)$

$O(E^2)$

(xxix)

Consider the given graph.



What is the weight of the minimum spanning tree using the Prim's algorithm, starting from vertex a?

- a) 23
- b) 28
- c) 27
- d) 10

(xxx) In Depth First Search, how many times a node is visited?

- a) Once
- b) Twice
- c) Equivalent to number of in degree of the node
- d) None of the mentioned

(xxxix) The main time taking step in fractional knapsack problem is

-
- a) Breaking items into fraction
 - b) Adding items into knapsack
 - c) Sorting
 - d) Looping through sorted items

(xxxix) Consider a complete graph G with 4 vertices. The graph G has _____ spanning trees.

- a) 15
- b) 8
- c) 16
- d) none of these

(xxxix) Given items as {value,weight} pairs $\{\{40,20\},\{30,10\},\{20,5\}\}$. The capacity of knapsack = 20. Find the maximum value output assuming items to be divisible.

- a) 60
- b) 80
- c) 100
- d) 40

(xxxix) Worst case is the worst case time complexity of Prim's algorithm if adjacency matrix is used?

- a) $O(\log V)$
- b) $O(V^2)$
- c) $O(V \log E)$
- d) $O(V \log E)$

$O(E^2)$

(xxxv) Consider the following 6 activities. Activity[] = {1, 2, 3, 4, 5, 6} start[] = {1, 3, 0, 5, 8, 5}; finish[] = {2, 4, 6, 7, 9, 9}; The maximum set of activities that can be executed by a single person is

- a) {1, 2, 3, 4}
- b) {2, 1, 3, 4}
- c) {1, 2, 4, 5}
- d) None of these

(xxxvi) If a problem can be solved by combining optimal solutions to non-overlapping problems, the strategy is called _____

- a) Dynamic programming
- b) Greedy
- c) Divide and conquer
- d) Recursion

(xxxvii) Which of the following algorithms solves the All-pair shortest path problem?

- a) Dijkstra's
- b) Floyd's Warshall's
- c) Prim's
- d) Kruskal's

(xxxviii) If a problem can be broken into subproblems which are reused several times, the problem possesses _____ property.

- a) Overlapping subproblems
- b) Optimal substructure
- c) Memoization
- d) Greedy

(xxxix) What is the time complexity of the dynamic programming implementation of the Knapsack problem with n items and a maximum weight of W?

- a) $O(n)$
- b) $O(n + w)$
- c) $O(nW)$
- d) $O(n^2)$

(xl) What approach is being followed in Floyd Warshall Algorithm?

- a) Greedy technique
- b) Dynamic Programming
- c) Linear Programming
- d) Backtracking

(xli) What is the time complexity of the dynamic programming implementation of the matrix chain problem?

- a) $O(1)$
- b) $O(n)$
- c) $O(n^2)$
- d) $O(n^3)$

(xlii) If an optimal solution can be created for a problem by constructing optimal solutions for its subproblems, the problem possesses _____ property.

- a) Overlapping subproblems
- b) Optimal substructure
- c) Memorization
- d) Greedy

(xliii) Consider the brute force implementation in which we find all the possible ways of multiplying the given set of n matrices. What is the time complexity of this implementation?

- a) $O(n!)$
- b) $O(n^3)$
- c) $O(n^2)$
- d) Exponential

(xliv) The Bellmann Ford algorithm returns _____ value.

- a) Boolean
- b) Integer
- c) String
- d) Double

(xlv) Bellmann ford algorithm provides solution for _____ problems.

- a) All pair shortest path
- b) Sorting
- c) Network flow
- d) Single source shortest path

(xlvi) How many times the for loop in the Bellmann Ford Algorithm gets

executed?

- a) V times
- b) V-1
- c) E
- d) E-1

(xlvi) What is the time complexity of Dijkstra's algorithm?

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

(xlviii) Dijkstra's Algorithm cannot be applied on _____

- a) Directed and weighted graphs
- b) Graphs having negative weight
- c) Unweighted graphs
- d) Undirected and unweighted graphs

(xlix) In what manner is a state-space tree for a backtracking algorithm constructed?

- a) Depth-first search
- b) Breadth-first search
- c) Twice around the tree
- d) Nearest neighbor first

(l) Backtracking algorithm is implemented by constructing a tree of choices called as?

- a) State-space tree
- b) State-chart tree
- c) Node tree
- d) Backtracking tree

(li) Which of the problems cannot be solved by backtracking method?

- a) n-queen problem
- b) subset sum problem
- c) Hamiltonian circuit problem
- d) travelling salesman problem

(lii) Which of the following is not a backtracking algorithm?

- a) Knight tour problem
- b) N queen problem

c) Lowest cost branch and bound

d) Highest cost branch and bound

(lx) Which data structure is most suitable for implementing the best first branch and bound strategy?

a) stack

b) queue

c) priority queue

d) linked list

(lxi) Which of the following branch and bound strategies leads to breadth first search?

a) LIFO branch and bound

b) FIFO branch and bound

c) Lowest cost branch and bound

d) Highest cost branch and bound

(lxii) Which of the following can traverse the state space tree only in DFS manner?

a) branch and bound

b) dynamic programming

c) greedy algorithm

d) backtracking

(lxiii) Which data structure is used for implementing a FIFO branch and bound strategy?

a) stack

b) queue

c) array

d) linked list

(lxiv) What is the worst case time complexity of the KMP algorithm for pattern searching (m = length of text, n = length of pattern)?

a) $O(n)$

b) $O(n*m)$

c) $O(m)$

d) $O(\log n)$

(lxv) The worst-case efficiency of solving a problem in polynomial time is?

a) $O(p(n))$

b) $O(p(n \log n))$

c) $O(p(n^2))$

d) $O(p(m \log n))$

(lxvi) Problems that can be solved in polynomial time are known as?

- a) intractable
- b) tractable
- c) decision
- d) complete

(lxvii) The Euler's circuit problem can be solved in-

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

(lxviii) How many stages of procedure does a non-deterministic algorithm consist of?

- a) 1
- b) 2
- c) 3
- d) 4

(lxix) To which of the following class does a CNF-satisfiability problem belong?

- a) NP class
- b) P class
- c) NP complete
- d) NP hard

(lxx) Which of the following problems is not NP complete?

- a) Hamiltonian circuit
- b) Bin packing
- c) Partition problem
- d) Halting problem