872

June 2022

307/5(N)

ALGORITHMS

Time Allowed: 3 Hours *Full Marks: 60*

Answer the following questions from Group-A, B & C as directed.

GROUP –A

1. Choose the correct alternative (Any ten) 1 x 10=10

i) Which of the following is asymptotically smallest? a) n b) log n c) n log n d) 2^n

ii) Which following statement is true? a) All graphs are trees b) All trees are graphs c) Some trees are graphs d) No tree is a graph

iii) Which of the following sorting algorithms is the fastest? a) Merge sort b) Quick sort c) Insertion sort d) Shell sort

iv) The given array is arr = {1, 2, 4, 3}. Bubble sort is used to sort the array elements. How many iterations will be done to sort the array? a) 4 b) 2 c) 1 d) 0

v) Choose the incorrect statement about merge sort from the following a) it is a comparison based sort b) it is an adaptive algorithm c) it is not an in-place algorithm d) it is a stable algorithm

vi). What is a randomized QuickSort? a) The leftmost element is chosen as the pivot b) The rightmost element is chosen as the pivot c) Any element in the array is chosen as the pivot d) A random number is generated which is used as the pivot

vii) Which of the following algorithm implementations is similar to that of an insertion sort?
A) Binary heap b) Quick sort c) Merge sort d) Radix sort

viii) Which of the following is true? a) Prim's algorithm initialises with a vertex b) Prim's algorithm initialises with an edge c) Prim's algorithm initialises with a vertex which has smallest edge d) Prim's algorithm initialises with a forest

ix) Given an array arr = {45,77,89,90,94,99,100} and key = 99; what are the mid values(corresponding array elements) in the first and second levels of recursion? a) 90 and 99 b) 90 and 94 c) 89 and 99 d) 89 and 94

x) What is a Rabin and Karp Algorithm? A) String Matching Algorithm b) Shortest Path Algorithm c) Minimum spanning tree Algorithm d) Approximation Algorithm

xi) 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) $O(E^2)$ d) O(V log E)

xii) Floyd Warshall Algorithm used to solve the shortest path problem has a time complexity of
a) O(V*V) b) O(V*V*V) c) O(E*V) d) O(E*E)

2. Fill in the blanks (Any ten): 1 x 10=10

i) Running time complexity of heap sort is _____.
ii) LIFO scheme is used in _____ data structure.
iii) An algorithm is a _____ to solve a problem
iv) Element of queue will be deleted from _____ end
v) Worst case for linear search is_____.
vi) Each node in a binary tree has atmost _____ child nodes
vii) O-notation provides an asymptotic _____.
viii) Deletion in heap requires _____number of arrays.
ix) Time complexity of insertion sort is _____
x) The process where two rotations are required to balance a tree is called _____.
xi) Big O notation derives the _____ case.
xii) _____ notation gives the lower bound of the function f(n).
xiii) Balance factor of AVL tree is_____.
xiv) _____ is the formula used in Euclid's algorithm for finding the greatest common divisor of two numbers.
xv) If algorithm takes O(n2), it is faster for sufficiently larger n than if it had taken _____.

3. Answer the following question (Any ten) 1 x 10 =10

i) Write one difference between path and cycle.
ii) Define insertion sort
iii) What is another name of height balanced binary search tree.
iv) What is the Greedy method?
v) Mention the various types of searching techniques in C.
vi) What is Linear Time Sorting?
vii) What is Collision?
viii) What is advantage of linked list representation of binary trees over arrays?
ix) What is cut vertex?
x) What is direct addressing?
xi) What is data abstraction?
xii) What is sink in a graph?
xiii) Define in-degree of a graph.
xiv) What is pivot in Quick Sort?

GROUP –B

4. Answer the questions (Any six) 2x6=12

i) Which is the best searching algorithm and why?
ii) Describe best case time complexity.
iii) Define 'Big Theta' Notation
iv) What do you mean by sorting?
v) Define Dynamic Programming algorithm.
vi) Why a sorting technique is called stable?
vii) Which one is more efficient – Insertion Sort or Merge Sort?
viii) Write the advantages of height balancing.
ix) What is Omega Notation & give example?
x) What is inorder traversal in BST?

xi) Describe spanning tree with an example.
xii) What do you mean by space complexity?

GROUP –C

5. Answer the question (any one): 6x1

a) What is an algorithm and what is the Complexity of the Algorithm?
b) Write an algorithm for the bubble sort method.
c) Draw and explain the colpitt oscillator. Write down Barkhausen criterion for oscillation.

6. Answer the question (any one) 6x1
a) What is space complexity? Write down the complexity of merge sort.
b) Write and explain recursive binary search algorithm.
c) Write Divide and Conquer algorithm with detailed explanation

7. Answer the question (any one) 6x1
a) Explain path, cycle and directed acyclic graph with proper examples.
b) Explain Directed Acyclic Graphs with Examples
c) Use Kruskal's algorithm to find out the minimum spanning tree for the graph.