

End Semester Examination, 2022

Semester - IV

Subject - BCA

Design and Analysis of Algorithms

PAPER - C8T

Full Marks : 40

Time : 2 Hours

Group - A

Attempt any five questions : 5x2=10

- 1.a) What are the five desirable properties an algorithm must have ?
- b) What do you mean by exhaustive search ?
- c) What is Ω -notation ?
- d) What do you mean by an NP problem ?
- e) Recurrence relation of an algorithm execution time is given by $T(n) = 2.T\left(\frac{n}{2}\right) + c.n$, where n is input size, and c is constant. What is the time complexity of this algorithm ?
- f) What do you mean by in-place sorting ?
- g) What is the worst case running time of any comparison based sorting ?
- h) What do you understand by greedy-choice property?

(Turn Over)

Group - B

Attempt any four questions : 4x5=20

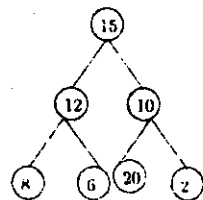
2. Perform radix sort on the list of elements given below : 5
123, 432, 564, 23, 1, 45, 755

3. Suppose, an algorithm has the following time complexity in terms of recurrence relation :

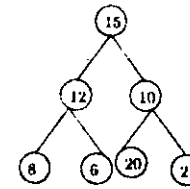
$$T(n) = 4.T\left(\frac{n}{4}\right) + n^2 \quad (1)$$

Solve this recurrence relation using Master's theorem.

4. Given two sorted arrays $A[1:m]$ and $B[1:n]$, we want to merge $A[]$, $B[]$ to obtain the sorted array $C[1:m+n]$. Write an algorithm for this task.
5. Consider the following graph. Find a sequence of vertices traversed in breadth first search, when the traversal starts from 15.



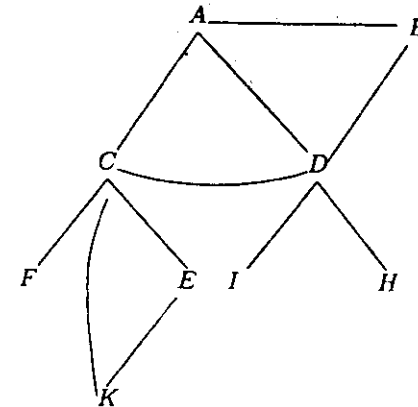
6. What do you understand by travelling salesman problem? Comment on its time complexity. 4+1
7. Define min heap. Consider the following binary tree. Is this a max heap? If no, then show pictorially, the steps to make it max heap. 1+1+3



Group - C

Attempt any one questions : 1x10=10

8. 4+4+2
- a. Prove that the worst-case time complexity of quicksort is $O(n^2)$.
- b. Consider the graph shown below.



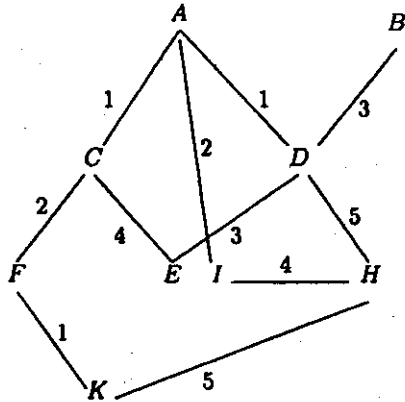
suppose, we want to traverse vertices of the above graph according to DFS algorithm. Let us assume that starting vertex is A. Find the order of graph vertices visited in DFS traversal.

- c. Give a solution of 4-queen problem.

9.

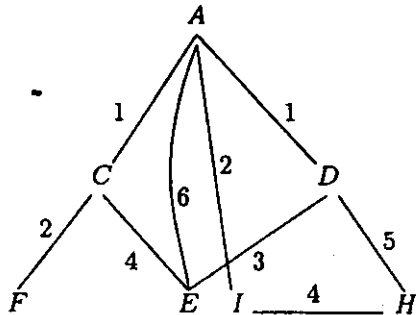
4+4+2

a. Consider the graph shown below.



Show how Kruskal's algorithm will include one edge after another to find minimum spanning tree from this graph.

b. Consider the graph shown below.



Show how Dijkstra's algorithm will find shortest path between A and E in this graph.

c. What do you mean by dynamic programming?