M.Sc. RNLKWC-/CS-202/22

## 2022
## COMPUTER SCIENCE
### M.Sc. Second Semester End Examination - 2022
### Paper - CS-202
### Design & Analysis of Algorithm

*Full Marks : 50*                                *Time : 2 hours*

*The figures in the right-hand margin indicate marks.*
*Candidates are required to give their answers in their own words as far as practicable.*
*Illustrate the answers wherever necessary.*

## Group - A

1. Answer any four questions.                    4×2=8

   a)  Time complexity of the recurrence relation $T(n)=25T(n/5) + n$ is

   b)  The total cost of the spanning tree of the following graph using Kruskal's Algorithm is
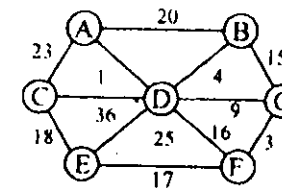
( 2 )

c) A feasible solution in fractinal Knapsack problem with Knapsack size M refers to a solution that has

   a) Maximum profit with weight less than M.

   b) Maximum profit with weight less than or equal to M

   c) Maximum profit only.

   d) Any of these.

d) What do you mean by the properties definite and finite properties that an algorithm must have?

e) A is the adjancency matrix of a graph. What does the value of (i,j) entry of $A^3$ convey?

f) What do you mean by stable sorting?

### Group - B

**Answer any four questions**            4×4=16

2. Apply Prim's algorithm to compute a minimum cost spanning tree for the following graph. Consider vertex 7 as the starting vertex.
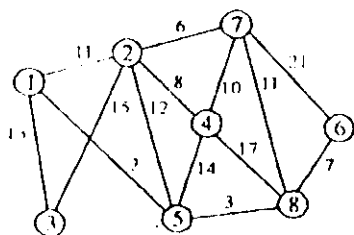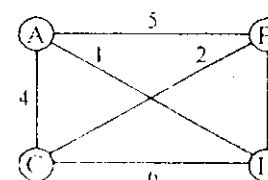
( 3 )

3. Fill out the dynamic programming table for the following 0-1 knapsack problem :

n=5, W=10

Items (weight, value) : $I_1(4,6)$, $I_2(2,4)$, $I_3(1,3)$, $I_4(6,9)$, $I_5(3,5)$

4. Explain the max-flow min-cut theorem with an example.

5. Find the shortest paths between all pairs of nodes in the following graph using Floyd's alrorithm.



6. Suppose. an altorithm has the following time complexity in terms of recurrence relation :

$$T(n) = 2. T\left(\frac{n}{2}\right) + n$$

7. What do you understand by NP complete? Write a short note on any one NP complete problem.      2+3

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## Group - C
### (Long answer type question)

Answer any two questions                          2×8=16

8.  a)  Find the optimal parenthesization of the following matrix chain :

    $M_1(10×20) * M_2(20×40) * M_3(40×5) * M_4(5×50) * M_5(50×10)$

   b)  Give an altorithm for the above procedure.     6+2=8

9.  a)  Sort the following elements using Heap sort :

    11  45  23  78  14  36

   b)  Find out best and worst-case time complextity of Quick sort.
   
   4+4=8

10. a)  Compare DFS and BFS.

   b)  Gompare dynamic programming and divide-and-conquer method.

   c)  Define the classes P and NP. Discuss diagramatically the relations among P class, NP class, NP-hard, and NP-complete.
   
   2+2+4=8

11. a)  Give a solution of 8-queen problem.

   b)  Give an efficient algorithm for multiplication of compatible Martices.
   
   4+4