

Note: Objective part is compulsory. Attempt any four questions from subjective part.

**Objective Part (Compulsory)**

- Q.1. Write short answers of the following in 2-3 lines each. (2\*16)
- Define Big-oh (O) notation.
  - What is meant by problems of optimality?
  - What are the different criteria used to improve the effectiveness of algorithm?
  - Write down the recursive solution for knapsack problem.
  - What is the time complexity of Prim's algorithm?
  - Write the difference between the Greedy method and Dynamic programming.
  - Differentiate between P and NP problems.
  - What is meant by Minimum Spanning Tree?
  - How problems are solved using Divide and Conquer approach?
  - Define all pair shortest path problem.
  - What is chained matrix multiplication?
  - What is the purpose of Dijkstra's Algorithm?
  - Write an algorithm using Recursive function to find sum of n numbers.
  - Write down the ingredients of Dynamic Programming.
  - What is activity selection problem?
  - Write the Recurrence relation of quicksort.

**Subjective Part (4\*12)**

- Q.2. Write the merge sort algorithm and discuss its efficiency. Sort the list E, X, A, M, P, L, E in alphabetical order using merge sort.
- Q.3. [06 Marks + 03 Marks + 03 Marks]
- Write down algorithm for Huffman code.
  - Why the code of character should not become a prefix in the code of another character?
  - What will happen if all the characters in the files are having almost equal frequency?
- Q4. Consider the following algorithm

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Algorithm Enigma (A[0.. n-1, 0.. n-1])
  for i → 0 to n-2 do
    for j ← i+1 to n-1 do
      if A[i, j] ≠ A[j, i]
        return false
    end for
  end for
  return true
end algorithm
  
```

- What does this algorithm compute? [3 Marks]
  - What is its basic operation?
  - How many times is the basic operation executed? [3 Marks]
  - What is the efficiency class of this algorithm?
  - Can this algorithm be further improved?
- Q.5. Define a finite automaton to match pattern ababc over alphabet  $\Sigma = \{a, b, c\}$ . Matching pattern ababc in text caabaabcaabababcccb.
- Q.6. The following matrix P is passed to Floyd Warshall algorithm. Run Floyd Warshall algorithm on the given input and calculate distance and Predecessor matrices.

Vertices	V1	V2	V3	V4
V1	0	3	8	$\infty$
V2	$\infty$	0	5	1
V3	$\infty$	4	0	$\infty$
V4	2	5	$\infty$	0

- Q7. Calculate f and l matrices for the following assembly line scheduling scenario. Also write the optimal way to produce an item.

