PART – A
(Answer all questions) 10 x 2 = 20
1. Evaluate an algorithm for computing gcd(m,n) using Euclid’s algorithm
2. Differentiate between Best, average and worst case efficiency.
3. Define convex hull problem
4. Discuss the recurrence equation for the worst case behavior of merge sort.
5. Explain multistage graph with example
6. Explain coin changing problem
7. Define slack and surplus variable
8. Explain Iterative improvement technique with example.
10. What is Hamiltonian path? Generalize that Hamiltonian cycle is an undirected graph.

PART – B 5 x 13 = 65
11.a Illustrate briefly on Big oh Notation, Omega Notation and Theta Notations. Give Examples.

(OR)

11.b Give the General Plan for Analyzing the Time Efficiency of Recursive Algorithms and use recurrence to find number of moves for Towers of Hanoi problem n

12.a i) Design a Quick sort algorithm
ii) Develop Best, worst and Average case analysis for Quicksort method.

(OR)

12.b Explain the concepts of the following.
i) Brute force string matching Algorithm.
ii) Closest pair and convex hull problems by brute force. (6)

13.a  i) Examine Dijkstra’s algorithm with a suitable example (9)
    ii) Illustrate how the minimum-sum descent problem can be solved by Dijkstra’s algorithm. (4)

    (OR)

13.b  i) Explain in detail about Huffman code (5)
    ii) Let A= \{l/119,m/96,c/247,g/283,h/72,f/77,k/92,j/19\} be the letters and its frequency of distribution in a text file. Analyze a suitable Huffman coding to compress the data. (8)

14.a  i) Discuss about the graphical method in detail. (7)
    ii) Summarize in detail about the simplex algorithm methods. (6)

    (OR)

14.b  i) Analyze about the stable marriage algorithm. (5)
    ii) Consider an instance of the stable marriage problem given by the ranking matrix.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\alpha)</td>
<td>1,3</td>
<td>2,2</td>
<td>3,1</td>
</tr>
<tr>
<td>(\beta)</td>
<td>3,1</td>
<td>1,3</td>
<td>2,2</td>
</tr>
<tr>
<td>(\gamma)</td>
<td>2,2</td>
<td>3,1</td>
<td>1,3</td>
</tr>
</tbody>
</table>

For each of its marriage matching’s, indicate whether it is stable or not. For the unstable matching’s, specify a blocking pair. For the stable matching’s indicate whether they are man-optimal, woman-optimal or neither. (Assume that the greek and English letters denote the man and woman respectively).

15.a  i) Evaluate the subset sum problem with set as \{3, 5, 6, 7, 2\} and the sum =15. Derive all the subsets. (6)
    ii) Evaluate the following instance of the knapsack problem by the branch and bound algorithm.

Knapsack capacity \(W=10\).

<table>
<thead>
<tr>
<th>Item</th>
<th>Weight</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>$40</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>$42</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>$25</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>$12</td>
</tr>
</tbody>
</table>
15.b Using Back-Tracking enumerate how can you solve the following problems.

i) 8-queens problem. (7)

ii) Hamiltonian circuit problem (6)

PART – C 1 x 15 = 15

16.a Evaluate and solve the following problem using (15) simplex method:
Maximize \( p = 2x + 3y + z \)
Subject to
\[
\begin{align*}
x + y + z & \leq 40 \\
2x + y - z & = 10 \\
-y + z & = 10
\end{align*}
\]
where \( x \geq 0, y \geq 0, z \geq 0 \)

16. b Apply Warshall’s algorithm to find the transitive closure of the digraph defined by the following adjacency matrix

\[
\begin{bmatrix}
0 & 1 & 0 & 0 \\
0 & 0 & 1 & 0 \\
0 & 0 & 0 & 1 \\
0 & 0 & 0 & 0
\end{bmatrix}
\]

i) Prove that the time efficiency of Warshall’s algorithm (7) is cubic

ii) Explain why the time efficiency of Warshall’s (8) algorithm is inferior to that of the traversal-based algorithm for sparse graphs represented by their adjacency lists.