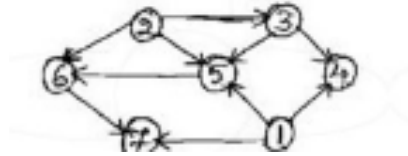1. a. Obtain the topological sort for the graph by using source removal method and DFS method


   b. Write the General method of Divide – And – Conquer approach

2. a. Define asymptotic notations for worst case, best case and average case time complexities with example.
   b. Solve it by recursive tree method $T(n) = 2T(n/2)+n^2$.

3. a. Write a recursive algorithm to search for a key element in an array of size n. Derive an equation for the best-case and worst-case complexity of your algorithm.
   b. Solve the given graph using Dijistra's method where Source is B.
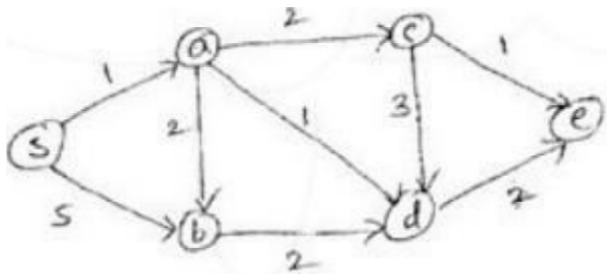
4. a. Construct minimum cost spanning tree using Prim's algorithm for the following graph.
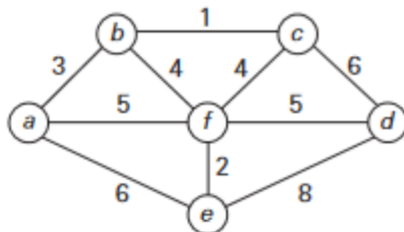
   b. With neat diagram explain different steps in designing and analyzing an algorithm

5. a. Find the optimal tour of the following given graph using travelling salesman problem (using exhaustive search method)
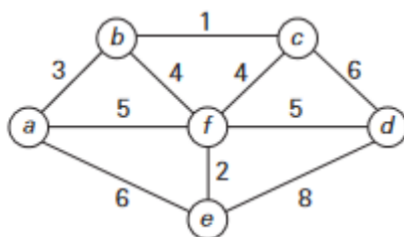

   b. Design an insertion sort algorithm and obtain its time complexity. Apply insertion sort on these elements. 25,75,40,10,20.

6. a. What are Huffman Trees? Construct the Huffman tree for the following data. Character A, B, C, D, E - Probability 0.5, 0.35, 0.5, 0.1, 0.4, 0.2 Encode DAD-CBE using Huffman Encoding

   b. Define transitive closure of a graph. Apply Warshalls algorithm to compute transitive closure of a directed graph
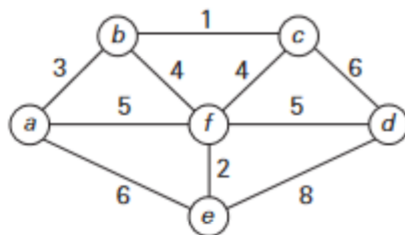
$$
\begin{array}{c|cccc}
 & a & b & c & d \\
\hline
a & 0 & 1 & 0 & 0 \\
b & 0 & 0 & 0 & 1 \\
c & 0 & 0 & 0 & 0 \\
d & 1 & 0 & 1 & 0 \\
\end{array}
$$

7. Solve it by master method $T(n) = 7T(n/3)+n^2$.

8. a. Solve the given graph using Dijistra's method where Source is B.
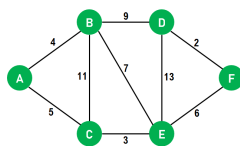
   b. Construct minimum cost spanning tree using Kruskals algorithm for the following graph.

9. a. Obtain the Huffman tree and the code for the following

Char	A	B	F	H	I	Y	Z
Frequency	9	7	4	2	8	1	3

   b. Find the optimal tour of the following given graph using travelling salesman problem (using exhaustive search method)
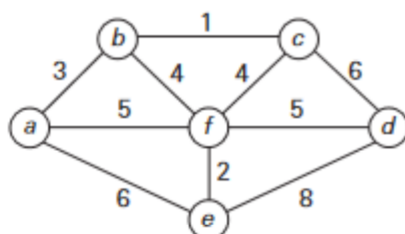
10. a. Write a C/C++ code for implementing Bubble Sort With time complexity.

   b. Write a C function for Floyd Warshall.

11. a. For the below given Knapsack problem instance, find the solution using exhaustive search method: Where, n=5, M=100

   $[w1,w2,w3,w4,w5] = [10,20,30,40,50]$

[p1,p2,p3,p4,p5] = [20,30,66,40,60]
b. Write a recurrence relation for Fibonacci series and solve it.
12. a. What are the fundamental steps involved in algorithmic problem-solving? Explain each step with an example.
b. Write the pseudocode for the Brute Force String Matching algorithm. Analyze the best-case, worst-case, and average-case time complexities of the Brute Force String Matching algorithm.
13. a. Solve the recurrence relation using Recursion tree method

$T(n) = 1$ if $n=1$

$2T(n/2)+f(n)$ if $n>1$ $f(n)=cn2$

b. Write Divide – And – Conquer recursive Merge sort algorithm and derive the time complexity of this algorithm

14. a. Solve the following Knapsack Problem using Exhaustive Search Capacity = 10kg Weight $(w1,w2,w3,w4) = (2,3,5,7)$ Values $(v1,v2,v3,v4) = \{10,15,25,35\}$
b. Obtain the topological sorting for the graph by using DFS method.
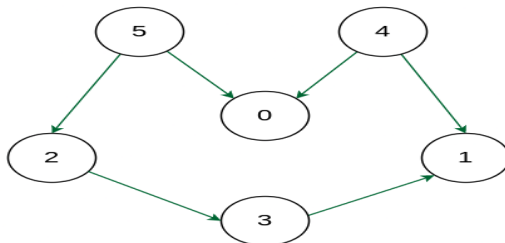
15. a. Discuss Strassen's matrix multiplication in detail.
b. Construct Huffman Tree for the following data

Character	A	B	C	D	E
Probability	0.4	0.1	0.2	0.15	0.15

Encode the text ABCDEBAFFA and decode the text 100010111001010 using the above code.

16. Given the following weighted adjacency matrix, compute the shortest paths using Floyd's Algorithm:

$$\begin{bmatrix} 0 & 3 & \infty & 5 \\ 2 & 0 & \infty & 4 \\ \infty & 1 & 0 & \infty \\ \infty & \infty & 2 & 0 \end{bmatrix}$$