We have discussed the single source shortest path problem and its solution due to Dijkstra's algorithm. We have illustrated the algorithm with a weighted undirected graph. The algorithm is equally applicable to solve the problem even if the graph is directed weighted, directed non-weighted, and non-weighted undirected, that is irrespective of the type of the graph. In case of non-weighted graph, the weight of each edge should be taken as 1.

Assignment 8.15

Show how the Dijkstra's algorithm works on each of the graphs shown in Figure 8.33. The source vertices are denoted by thick circles.
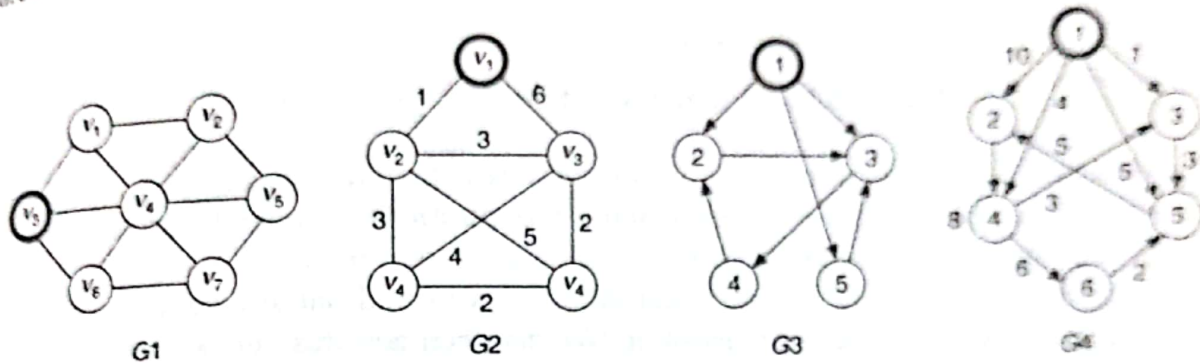

Figure 8.33

Assignment 8.16

There is another way to solve the single source shortest path problem. This approach is very similar to the breadth first search (BFS); the modification that is required is to use a priority queue instead of ordinary queue as used in BFS method. The priority of a vertex in the queue will be determined by the shortest path length of its predecessor plus the arc length (weight) from the predecessor to the vertex.
Write an algorithm based on the above-mentioned approach.

Assignment 8.17

Figure 8.34 gives a road map connecting various places in a city and the cost of the tickets. Find the most economical route from place X to Y.
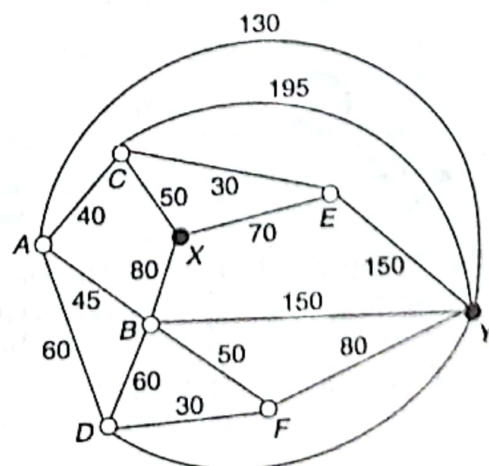

Figure 8.34   A road map.