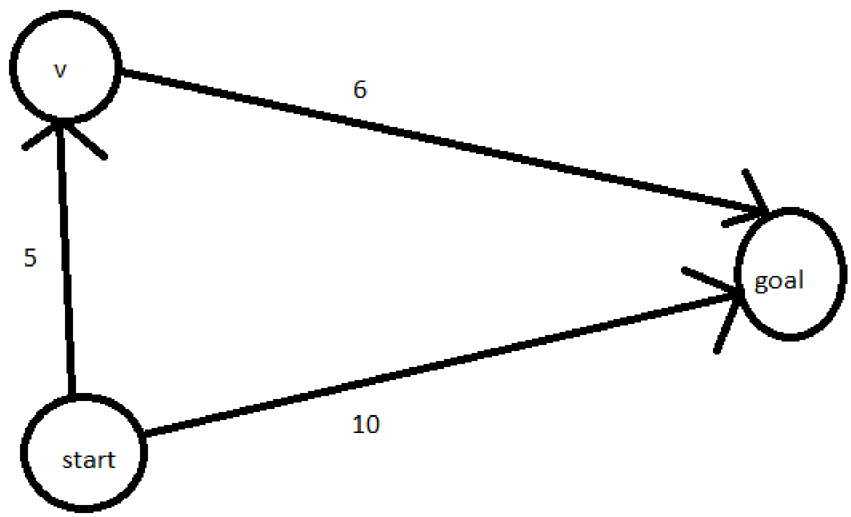
1. No. this greedy strategy will not always find a shortest path from start to goal



When starting from start in the above graph, v will have the minimum weight with start, with the weight of 5 it will be selected in the path and the next time v will be taken as a starting vertex and the edge (v, goal) or weight 6 will be selected in the path. If such a pat is followed, then we have a weight of 5 + 6 = 11 which is >10. If we took the path from start to goal, we would have a weight of 10 which is less that 11 from the previous path. It is clear now that this algorithm will not always give the “greedy” results we want.

2.

START

FUNCTION **minimumCostPath (int u, int destination, visited array [ ], graph G, bool prev_edge)**

```
//check if we find the destination then further cost will be 0
   if (u = destination)
      return 0;
// mark the current node as visited
   visited[u] = 1
Initialize ans to Infinite value
// traverse through all the adjacent nodes
FOR all the adjacent vertex(node) of a vertex u

         If node is not visited then
                  If edge = red AND prev_edge = true then

                           Do not continue this path
                  ELSE
                           continue to this path and calculate the cost of the further path
                           CALL FUNCTION minimumCostPath(node, destination,
                           visited [ ], Graph, curr_edge)

                           And assign the value returned by this call to variable cost

                           IF cost < INF then
                           ans = Minimum of (ans, previous edge weight + current edge weight)
                           //Taking the minimum cost path


// unmarking the current node to make it available for other simple paths

visited[u] = 0
```

END

Running time: O(E+V) e = edges and V = vertices

3.

```
G(V.E);  Graph, V-Vertices
                 E - Edges.
Void minDistance ( Graph *G, int s)
      priorityQueue *pQ;
      int v, w;
      Enque (pQ, s);
      for ( i <- o, i< g -> v; i++)
                 Distance [i] = INT_MAX;
      Distance[s] <- 0;
      while (!isemplyQueue(pQ))
             V= Deletemin ( PQ) ;
              For (v to w)
                   d = Distance [v] + weight[v][w]
                   if (Distance[w] = INT_MAX)
                         Distance [w] = d
                         enque (pQ, w}
                        path[w] = v
                 if (Distance[w] > d)
                        Distance [w] =d
                        update (pQ, w)
                        path[w] = v
```

Time Complexity: $O(v^2)$

4.

Let G = (V, E) be the given graph, with | V| = n

Start with a graph T = (V, phi) consisting of only the

vertices of G and no edges;

Arrange E in the order of increasing costs;

for (i = 1, i to n - 1, i + +)

Select the next smallest cost edge;

if (the edge connects two different connected components)

add the edge to T;