Exercise 4. Answer Sheet

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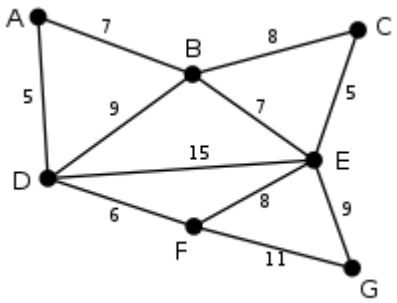
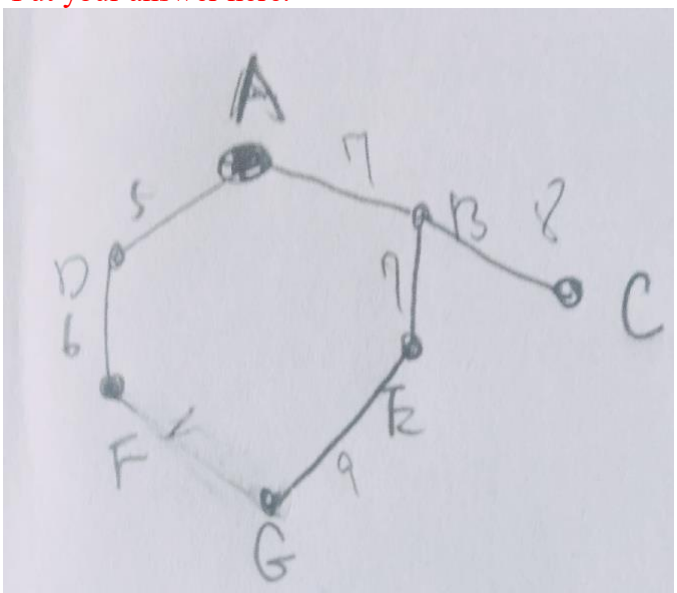
Problem 1. (*50 points*) Consider the following graph and assume node A as a root.



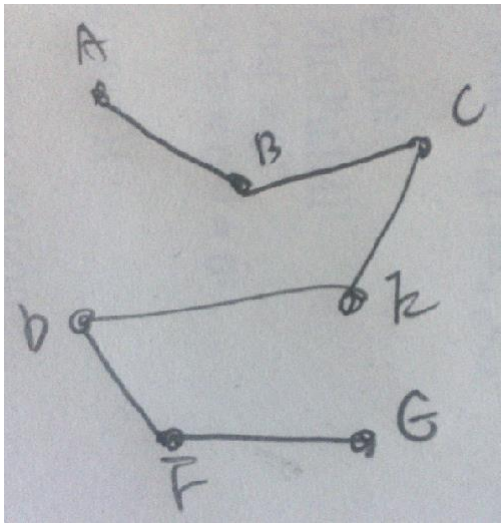
a) Draw a spanning tree obtained by using the Breadth Fist Search (BFS) algorithm.

Put your answer here.



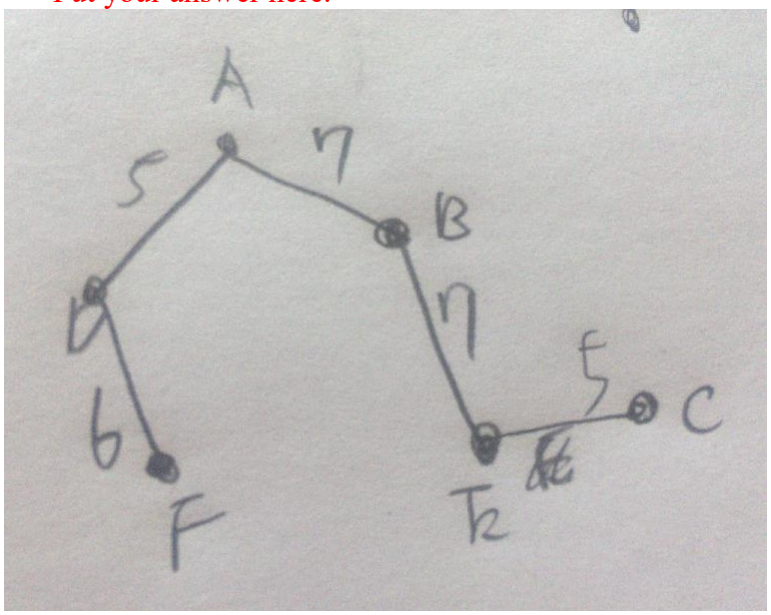
b) Draw a spanning tree obtained by using the Depth First Search (DFS) algorithm.

Put your answer here.



c) Draw the minimum spanning tree obtained by the Prim's algorithm.

Put your answer here.



Problem 2. *(50 points)* Write a program implementing Kruskal's algorithm. Upload your source code. Show your input graph and the obtained MST in the space below.

```
#include<stdio.h>

#define MAX 50

int G[MAX][MAX],n;


typedef struct edge
{
```

```
  int u,v,w;
}edge;

typedef struct edgelist
{
  edge data[MAX];
  int n;
}edgelist;

edgelist spanlist;
edgelist elist;

void kruskal();
int find(int belongs[],int vertexno);
void union1(int belongs[],int c1,int c2);
void sort();
void print();

int main()
{
  int i,j,total_cost;

  printf("\nEnter number of vertices:");

  scanf("%d",&n);

  printf("\nEnter the adjacency matrix:\n");

  for(i = 0;i < n;i ++)
    {
      for(j = 0;j < n;j ++)
      {
        scanf("%d",&G[i][j]);
      }
    }

  kruskal();
  print();
}

void kruskal()
{
  int belongs[MAX];
  int i,j,cno1,cno2;
  elist.n = 0;

  for(i = 1;i < n;i ++)
    for(j = 0;j < i;j ++)
      {
      if(G[i][j] != 0)
        {
          elist.data[elist.n].u = i;
          elist.data[elist.n].v = j;
          elist.data[elist.n].w = G[i][j];
```

```
          elist.n ++;
        }
      }

  sort();

  for(i = 0;i < n;i ++)
    belongs[i] = i;

  spanlist.n = 0;

  for(i = 0;i < elist.n;i ++)
    {
      cno1=find(belongs,elist.data[i].u);
      cno2=find(belongs,elist.data[i].v);

      if(cno1 != cno2)
        {
        spanlist.data[spanlist.n] = elist.data[i];
        spanlist.n = spanlist.n+1;
        union1(belongs,cno1,cno2);
        }
    }
}

int find(int belongs[],int vertexno)
{
  return(belongs[vertexno]);
}

void union1(int belongs[],int c1,int c2)
{
  int i;

  for(i = 0;i < n;i ++)
    if(belongs[i] == c2)
      belongs[i] = c1;
}

void sort()
{
  int i,j;
  edge temp;

  for(i = 1;i < elist.n;i ++)
    for(j = 0;j < elist.n-1;j ++)
      if(elist.data[j].w > elist.data[j+1].w)
      {
        temp = elist.data[j];
        elist.data[j] = elist.data[j+1];
        elist.data[j+1] = temp;
      }
}
```

```
void print()
{
  int i;

  for(i = 0;i < spanlist.n;i ++)
    {
      printf("\n%d      %d      %d",spanlist.data[i].u,spanlist.data[i].v,spanlist.data[i].w);

    }
  printf("\n");
}
```

Input
Enter number of vertices:6

Enter the adjacency matrix:

0 3 1 6 0 0

3 0 5 0 3 0

1 5 0 5 6 4

6 0 5 0 0 2

0 3 6 0 0 6

0 0 4 2 6 0

Output

2 0 1

5 3 2

1 0 3

4 1 3

5 2 4