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Subject: DAA	Date of Submission: 18-10-2021

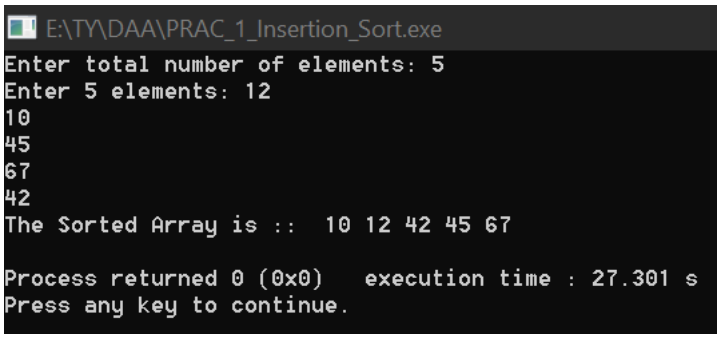
Practical 1 – Insertion Sort

Code

```
#include <stdio.h>


int insertionSort(int size, int *array);


int main()
{
	int size, i , array[21];
	printf("Enter total number of elements: ");
	scanf("%d", &size);
	printf("Enter %d elements: ", size);
	for(i=0; i<size; i++)
	  scanf("%d", &array[i]);
	insertionSort(size, array);
	printf("The Sorted Array is :: ");
	for(i=0; i<size; i++)
	  printf(" %d", array[i]);
	printf("\n");
	return 0;
}


int insertionSort(int size, int *array)
{
	int i, j;
	int temp;
	for(i=1; i<size; i++){
		temp=array[i];
		j= i-1;
```

```
                while((temp < array[j])&&(j >= 0))
    {
                        array[j+1] = array[j];
                        j= j-1;
                }
                array[j+1] = temp;
        }
        return 1;
}
```

Output



Practical 2 – Merge Sort

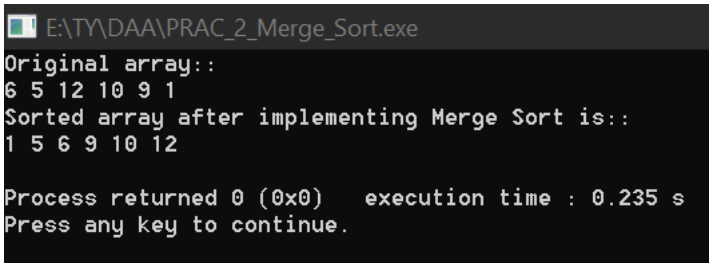
Code

```
#include <stdio.h>


void merge(int arr[], int start, int mid, int end)
{
 int len1 = mid - start + 1;
 int len2 = end - mid;
 int leftArr[len1], rightArr[len2];
 for (int i = 0; i < len1; i++)
 {
    leftArr[i] = arr[start + i];
 }
 for (int j = 0; j < len2; j++)
 {
```

```
    rightArr[j] = arr[mid + 1 + j];
  }
  int i, j, k;
  i = 0;
  j = 0;
  k = start;
  while (i < len1 && j < len2) {
    if (leftArr[i] <= rightArr[j])
    {
      arr[k] = leftArr[i];
      i++;
    }
    else
    {
      arr[k] = rightArr[j];
      j++;
    }
    k++;
  }
  while (i < len1)
  {
    arr[k] = leftArr[i];
    i++;
    k++;
  }
  while (j < len2) {
    arr[k] = rightArr[j];
    j++;
    k++;
  }
}
```

```
void mergeSort(int arr[], int start, int end) {
  if (start < end)
  {
    int mid = start + (end - start) / 2;
    mergeSort(arr, start, mid);
    mergeSort(arr, mid + 1, end);
    merge(arr, start, mid, end);
  }
}
void display(int arr[], int size) {
  for (int i = 0; i < size; i++)
    printf("%d ", arr[i]);
  printf("\n");
}
int main()
{
  int arr[] = {6, 5, 12, 10, 9, 1};
  int size = sizeof(arr) / sizeof(arr[0]);
  printf("Original array::\n");
  display(arr, size);
  mergeSort(arr, 0, size - 1);
  printf("Sorted array after implementing Merge Sort is::\n");
  display(arr, size);
}
```

Output



Practical 3 – Quick Sort

Code

```
#include<stdio.h>


int main()
{
  int arr[20], n, i;
  printf("Enter the size of the array:: \n");
  scanf("%d", &n);
  printf("Enter the elements to be sorted of size %d::\n",n);
  for(i = 0; i < n; i++)
    scanf("%d", &arr[i]);
  quicksort(arr, 0, n-1);
  printf("\n\nSorted array after implementing Quick sort are as follows ::\n");
  for(i = 0; i < n; i++)
    printf("%d ", arr[i]);
  return 0;
}


void quicksort(int *arr, int low, int high)
{
  int pivot, i, j, temp;
  if(low < high) {
    pivot = low;
    i = low;
    j = high;
    while(i < j) {
      while(arr[i] <= arr[pivot] && i <= high)
        i++;
      while(arr[j] > arr[pivot] && j >= low)
        j--;
```

```
    if(i < j) {
      temp = arr[i];
      arr[i] = arr[j];
      arr[j] = temp;
    }
   }
   temp = arr[j];
   arr[j] = arr[pivot];
   arr[pivot] = temp;
   quicksort(arr, low, j-1);
   quicksort(arr, j+1, high);
 }
}
```

Output

```
E:\TY\DAA\PRAC_3_Quick_Sort.exe
Enter the size of the array::
5
Enter the elements to be sorted of size 5::
1
4
6
3
9


Sorted array after implementing Quick sort are as follows ::
1 3 4 6 9
Process returned 0 (0x0)   execution time : 12.489 s
Press any key to continue.
```

Practical 4 – Knapsack

FRACTIONAL

Code

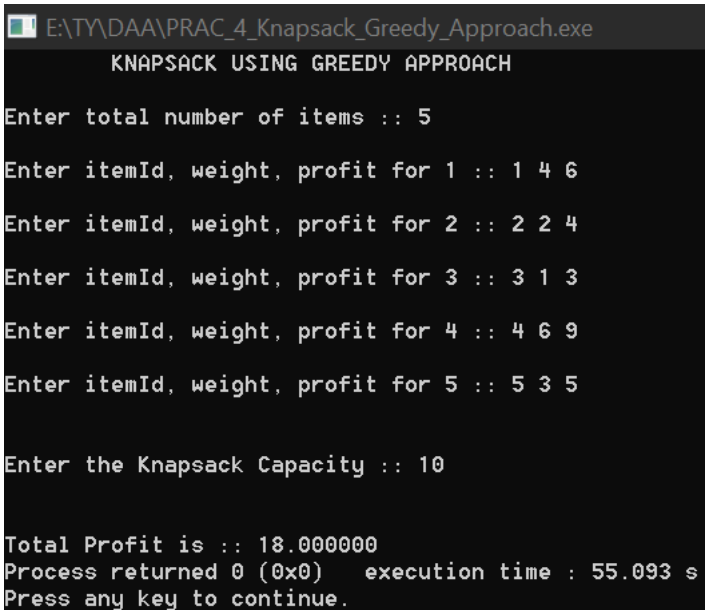
```
#include <stdio.h>

#include <stdlib.h>


typedef struct Item

{

   int itemId;
```

```
    int weight;
    int profit;
    float PBW;
    float xi;
} Item;

void margeRev(Item *arr, int low, int mid, int high)
{
    int i = low;
    int j = mid + 1;
    int c = 0;
    int temp_Arr_size = high - low + 1;
    Item *tempArr = (Item *)malloc(sizeof(arr[0]) * temp_Arr_size);

    while (i <= mid && j <= high)
        if (arr[i].PBW > arr[j].PBW)
            tempArr[c++] = arr[i++];
        else
            tempArr[c++] = arr[j++];

    while (i <= mid)
        tempArr[c++] = arr[i++];

    while (j <= high)
        tempArr[c++] = arr[j++];

    for (i = low, c = 0; i <= high; i++)
        arr[i] = tempArr[c++];
}
void margeSortRev(Item *arr, int low, int high)
{
```

```
    if (low < high)
    {
        int mid = (high + low) / 2;
        margeSortRev(arr, low, mid);
        margeSortRev(arr, mid + 1, high);
        margeRev(arr, low, mid, high);
    }
}

float fractionalknapsack(Item *items, int n, int capacity)
{
    margeSortRev(items, 0, n - 1);
    float profit = 0;
    int i = 0;
    int takenWeight = 0;
    for (i = 0; i < n; i++)
    {
        if (takenWeight + items[i].weight <= capacity)
        {
            profit += items[i].profit;
            takenWeight += items[i].weight;
            items[i].xi = 1;
        }
        else
        {
            items[i].xi = ((float)capacity - takenWeight) / items[i].weight;
            takenWeight += items[i].xi * items[i].weight;
            profit += items[i].xi * items[i].profit;
            break;
        }
    }
```

```
    return profit;
}

int main()
{
    int n, i, knapsackCapacity;
    printf("\tKNAPSACK USING GREEDY APPROACH\n");
    printf("\nEnter total number of items :: ");
    scanf("%d", &n);

    Item *items = (Item *)malloc(sizeof(Item) * n);
    for (i = 0; i < n; i++)
    {
        printf("\nEnter itemId, weight, profit for %d :: ",i+1);
        scanf("%d %d %d", &items[i].itemId, &items[i].weight, &items[i].profit);
        items[i].PBW = (float)items[i].profit / items[i].weight;
    }

    printf("\n\nEnter the Knapsack Capacity :: ");
    scanf("%d", &knapsackCapacity);
    float totalProfit = fractionalknapsack(items, n, knapsackCapacity);
    printf("\n\nTotal Profit is :: %f", totalProfit);

    return 0;
}
```

Output



0-1

Code

Output

Practical 5 – Dijkstra's Algorithm

Code

```
#include<stdio.h>
#include<conio.h>
#include<time.h>
#define INFINITY 9999
#define MAX 10

void ALGO(int G[MAX][MAX],int n,int startnode);

int main()
{
	int G[MAX][MAX],i,j,n,u;
	printf("\tDIJKSTRA ALGORITHM!!!\n");
	printf("\nEnter the total no. of nodes :: ");
```

```
            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]);
      }
   }
            printf("\nEnter the starting node :: ");
            scanf("%d",&u);
            printf("\n\n\tTHE DIJKSTRA ALGORTIHM IS LOADING...");
            delay(8);
            printf("\n\n\tLoaded 100%%");
            delay(3);
            printf("\n\nThe answers for individual nodes along with their respective path are as follows
:: \n");
            delay(1);
            ALGO(G,n,u);
            printf("\n\n\n");
            return 0;
}

void delay(int second)
{
   int milsec = 1000 * second;
   clock_t startTime = clock();
   while(clock() < (startTime + milsec));
}

void ALGO(int G[MAX][MAX],int n,int startnode)
```

```
{
        int cost[MAX][MAX],distance[MAX],pred[MAX];
        int visited[MAX],count,mindistance,nextnode,i,j;
        for(i=0;i<n;i++)
  {
     for(j=0;j<n;j++)
                        if(G[i][j]==0)
                                cost[i][j]=INFINITY;
                        else
                                cost[i][j]=G[i][j];
  }
        for(i=0;i<n;i++)
        {
                distance[i]=cost[startnode][i];
                pred[i]=startnode;
                visited[i]=0;
        }
        distance[startnode]=0;
        visited[startnode]=1;
        count=1;
        while(count<n-1)
        {
                mindistance=INFINITY;
                for(i=0;i<n;i++)
                        if(distance[i]<mindistance&&!visited[i])
                        {
                                mindistance=distance[i];
                                nextnode=i;
                        }
                        visited[nextnode]=1;
                        for(i=0;i<n;i++)
```

```
                                if(!visited[i])
                                        if(mindistance+cost[nextnode][i]<distance[i])
                                        {
                                                distance[i]=mindistance+cost[nextnode][i];
                                                pred[i]=nextnode;
                                        }
                count++;
        }
        for(i=0;i<n;i++)
                if(i!=startnode)
                {
                        printf("\n\nDistance of node [%d] :: %d",i,distance[i]);
                        printf("\nAnd the Path for the same is :: %d",i);
                        j=i;
                        do
                        {
                                j=pred[j];
                                printf(" <- %d",j);
                        }
                        while(j!=startnode);
    }
}
```

Output

```
E:\TY\DAA\PRAC_5_Dijkistra_algo.exe
        DIJKSTRA ALGORITHM!!!

Enter the total no. of nodes :: 5

Enter the adjacency matrix ::
0 10 3 0 0
0 0 1 2 0
0 4 0 8 2
0 0 0 0 7
0 0 0 9 0

Enter the starting node :: 0


        THE DIJKSTRA ALGORTIHM IS LOADING...

        Loaded 100%

The answers for individual nodes along with their respective path are as follows ::


Distance of node [1] :: 7
And the Path for the same is :: 1 <- 2 <- 0

Distance of node [2] :: 3
And the Path for the same is :: 2 <- 0

Distance of node [3] :: 9
And the Path for the same is :: 3 <- 1 <- 2 <- 0

Distance of node [4] :: 5
And the Path for the same is :: 4 <- 2 <- 0



Process returned 0 (0x0)   execution time : 36.578 s
Press any key to continue.
```

Practical 6 – Kruskal's Algorithm

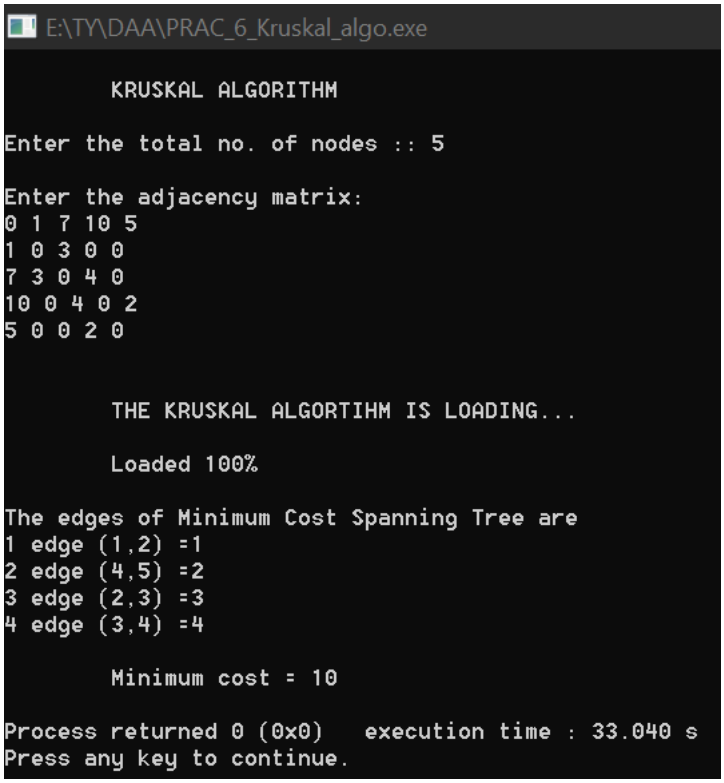
Code

```
#include<stdio.h>

#include<conio.h>

#include<stdlib.h>



int i,j,k,a,b,u,v,n,ne=1;

int min,mincost=0,cost[9][9],parent[9];

int find(int);

int uni(int,int);

void delay(int);
```

```
int main()
{
	printf("\n\tKRUSKAL ALGORITHM\n");
	printf("\nEnter the total no. of nodes :: ");
	scanf("%d",&n);
	printf("\nEnter the adjacency matrix:\n");
	for(i=1;i<=n;i++)
	{
		for(j=1;j<=n;j++)
		{
			scanf("%d",&cost[i][j]);
			if(cost[i][j]==0)
				cost[i][j]=999;
		}
	}
	printf("\n\n\tTHE KRUSKAL ALGORTIHM IS LOADING...");
	printf("\n\n\tLoaded 100%%");
	printf("\n\nThe edges of Minimum Cost Spanning Tree are\n");
	while(ne < n)
	{
		for(i=1,min=999;i<=n;i++)
		{
			for(j=1;j <= n;j++)
			{
				if(cost[i][j] < min)
				{
					min=cost[i][j];
					a=u=i;
					b=v=j;
				}
			}
```

```
                }
                u=find(u);
                v=find(v);
                if(uni(u,v))
                {
                        printf("%d edge (%d,%d) =%d\n",ne++,a,b,min);
                        mincost +=min;
                }
                cost[a][b]=cost[b][a]=999;
        }
        printf("\n\tMinimum cost = %d\n",mincost);
        return 0;
}

int find(int i)
{
        while(parent[i])
        i=parent[i];
        return i;
}

int uni(int i,int j)
{
        if(i!=j)
        {
                parent[j]=i;
                return 1;
        }
        return 0;
}
```

Output



Practical 7 – Tree Traversal

Code

```
#include<stdio.h>

#include<conio.h>

#include<stdlib.h>


struct node

{

   struct node *left;

   int data;

   struct node *right;

};


struct node *tree=NULL;


struct node* insertelement(struct node *tree,int n)

{
```

```
   struct node *newnode,*nodeptr,*parentptr;
   newnode=(struct node *)malloc(sizeof(struct node));
   newnode->data=n;
   newnode->left=NULL;
   newnode->right=NULL;
   if(tree==NULL)
   {
      tree=newnode;
   }
   else
   {
      parentptr=NULL;
      nodeptr=tree;
      while(nodeptr!=NULL)
      {
      parentptr=nodeptr;
      if(n<nodeptr->data)
         nodeptr=nodeptr->left;
      else
         nodeptr = nodeptr->right;
      }
      if(n<parentptr->data)
         parentptr->left=newnode;
      else
         parentptr->right=newnode;
   }
   return tree;
}
int inorder(struct node *tree)
{
   while(tree!=NULL)
```

```
   {
      inorder(tree->left);
      printf("\t%d",tree->data);
      inorder(tree->right);
      return tree;
   }
}

int postorder(struct node *tree)
{
   while(tree!=NULL)
   {
      preorder(tree->left);
      preorder(tree->right);
      printf("\t%d",tree->data);
      return tree;
   }
}

int preorder(struct node *tree)
{
   while(tree!=NULL)
   {
      printf("\t%d",tree->data);
      preorder(tree->left);
      preorder(tree->right);
      return tree;
   }
}

int main()
```

```
{
   int n,ch;
   printf("\tBinary Search Tree Traversal\n");
   printf("\n\tMenu:\n");
   printf("1.Insert Elements\n2.In-Order\n3.Pre-Order\n4.Post-Order\n5.Exit");
   while(ch!=5)
   {
      printf("\n\nEnter your Choice :: ");
      scanf("%d",&ch);
      switch(ch)
      {
         case 1: printf("\nEnter the Element :: ");
                 scanf("%d",&n);
                 tree=insertelement(tree,n);
                 break;

         case 2: printf("\tThe In-Order sequence for the given string is as follows::\n");
                 n=inorder(tree);
                 break;

         case 3: printf("\tThe Pre-Order sequence for the given string is as follows::\n");
                 n=preorder(tree);
                 break;

         case 4: printf("\tThe Post-Order sequence for the given string is as follows::\n");
                 n=postorder(tree);
                 break;

         case 5: printf("\tSure Boss Exiting!!\n\tGood Bye\n\n");
                 break;
      }
```

```
  }

  return 0;

}
```

Output

```
E:\TY\DAA\PRAC_7_Tree_Traversal.exe
        Binary Search Tree Traversal

        Menu:
1.Insert Elements
2.In-Order
3.Pre-Order
4.Post-Order
5.Exit

Enter your Choice :: 1

Enter the Element :: 1


Enter your Choice :: 1

Enter the Element :: 2


Enter your Choice :: 1

Enter the Element :: 3


Enter your Choice :: 1

Enter the Element :: 4


Enter your Choice :: 1

Enter the Element :: 5


Enter your Choice :: 1

Enter the Element :: 9


Enter your Choice :: 2
        The In-Order sequence for the given string is as follows::
        1       2       3       4       5       9

Enter your Choice :: 3
        The Pre-Order sequence for the given string is as follows::
        1       2       3       4       5       9
Enter your Choice :: 4
        The Post-Order sequence for the given string is as follows::
        2       3       4       5       9       1

Enter your Choice :: 5
        Sure Boss Exiting!!
        Good Bye


Process returned 0 (0x0)   execution time : 12.990 s
Press any key to continue.
```

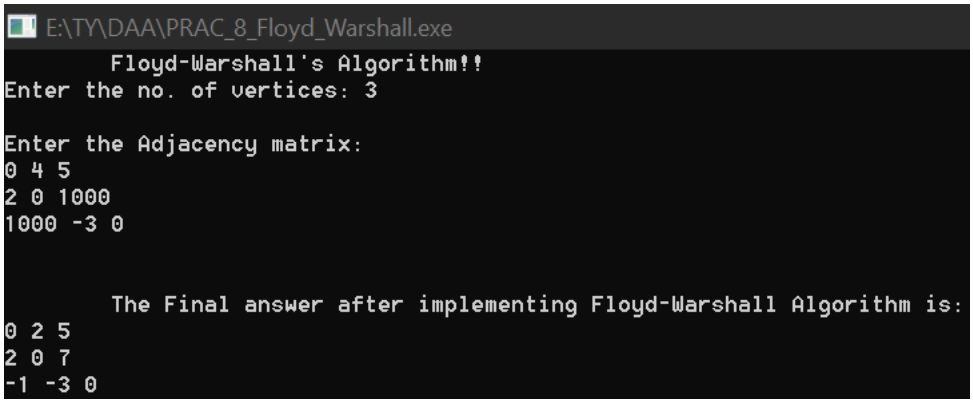
Practical 8 – Floyd Warshall

Code

```
#include<stdio.h>
#include<conio.h>


void floyd(int cost[10][10],int n)
{
   int i,j,k,t,x[10][10];
   for(i=0;i<n;i++)
   {
      for(j=0;j<n;j++)
      {
         x[i][j]=cost[i][j];
      }
   }
   for(k=0;k<n;k++)
   {
      for(i=0;i<n;i++)
         {
            for(j=0;j<n;j++)
               {
                  if((x[i][k]==1000) || (x[k][j]==1000))
                  t=1000;
                  else
                  t=x[i][k]+x[k][j];
                  x[i][j]=(x[i][j]>t?t:x[i][j]);
               }
         }
   }
    printf("\n\n\tThe Final answer after implementing Floyd-Warshall Algorithm is:\n");
   for(i=0;i<n;i++)
```

```
    {
        for(j=0;j<n;j++)
        {
            printf("%d ",x[i][j]);
        }
        printf("\n");
    }
}

int main()
{
    int i,j,n,a[10][10];
    printf("\tFloyd-Warshall's Algorithm!!");
    printf("\nEnter the no. 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",&a[i][j]);
        }
    }
    floyd(a,n);
    getch();
    return 0;
}
```

Output


E:\TY\DAA\PRAC_8_Floyd_Warshall.exe
Floyd-Warshall's Algorithm!!
Enter the no. of vertices: 3
Enter the Adjacency matrix:
0 4 5
2 0 1000
1000 -3 0
The Final answer after implementing Floyd-Warshall Algorithm is:
0 2 5
2 0 7
-1 -3 0