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1. Implement Binary Search using Divide and Conquer approach

Objective:

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

int Binary_search(int arr[],int l,int u, int SrchElmnt)
 {
     if(l<=u)
     {
      int mid = (l+ u)/2;

      if(arr[mid]==SrchElmnt)
       return 1;

       else if(arr[mid]>SrchElmnt)
        return Binary_search(arr,l,mid-1,SrchElmnt);

        else
          return Binary_search(arr,mid+1,u,SrchElmnt);
   }

   return 0;
}

main()
{
 int arr[15]={3,4,5,6,7,8,4,5,2,8,9,13,14,17,19};

 int n=15;

  int S=79;

  if(Binary_search(arr,0,n-1,S)==1)
        printf("found");
  else
        printf("not found");
}
```

2. Implement Merge Sort using Divide and Conquer approach

```
#include<stdio.h>

void mergesort(int a[],int i,int j);
void merge(int a[],int i1,int j1,int i2,int j2);

int main()
{
        int a[n0],n,i;
        printf("Enter no of elements:");
        scanf("%d",&n);
        printf("Enter array elements:");

        for(i=0;i<n;i++)
                scanf("%d",&a[i]);

        mergesort(a,0,n-1);

        printf("\nSorted array is :");
        for(i=0;i<n;i++)
                printf("%d ",a[i]);

        return 0;
}


void mergesort(int a[],int i,int j)
{
        int mid;
        if(i<j)
        {
                mid=(i+j)/2;
                mergesort(a,i,mid);          //left recursion
                mergesort(a,mid+1,j);        //right recursion
                merge(a,i,mid,mid+1,j);   //merging of two sorted sub-arrays
        }
}
```

```
void merge(int a[],int i1,int j1,int i2,int j2)
/*As we are using one array instead of taking 2 different array, one array, a[] is
taken, but a[] had to be divided into two part from the index i1 to j1 and from the
index i2 to j2 */
{
        int temp[50];                   //array used for merging
        int i,j,k;
        i=i1;                           //beginning of the first list
        j=i2;                           //beginning of the second list
        k=0;

        while(i<=j1 && j<=j2)   //while elements in both lists
        {
                if(a[i]<a[j])
                        temp[k++]=a[i++];
                else
                        temp[k++]=a[j++];
        }

        while(i<=j1)                    //copy remaining elements of the first list
                temp[k++]=a[i++];

        while(j<=j2)                    //copy remaining elements of the second list
                temp[k++]=a[j++];

        /*******    Transfer elements from temp[] back to a[]    ********/
        for(i=i1,j=0;i<=j2;i++,j++)
                a[i]=temp[j];
}
```

3. Implement Quick Sort using Divide and Conquer approach

```
#include <stdio.h>

void quick_sort(int[],int,int);
int partition(int[],int,int);

int main()
{
        int a[50],n,i;
        printf("How many elements?");
        scanf("%d",&n);
        printf("\nEnter array elements:");

        for(i=0;i<n;i++)
                scanf("%d",&a[i]);

        quick_sort(a,0,n-1);
        printf("\nArray after sorting:");

        for(i=0;i<n;i++)
                printf("%d ",a[i]);

        return 0;
}

void quick_sort(int a[],int l,int u)
{
        int j;
        if(l<u)
        {
                j=partition(a,l,u);
                quick_sort(a,l,j-1);
                quick_sort(a,j+1,u);
        }
}
```

```
int partition(int a[],int l,int u)
{
        int v,i,j,temp;
        v=a[l];
        i=l;
        j=u+1;

        do
        {
                do
                        i++;

                while(a[i]<v&&i<=u);

                do
                        j--;
                while(v<a[j]);

                if(i<j)
                {
                        temp=a[i];
                        a[i]=a[j];
                        a[j]=temp;
                }
        }while(i<j);

        a[l]=a[j];
        a[j]=v;

        return(j);      //Position of Pivot Element
}
```

4. Find Maximum and Minimum element from a array of integer using Divide and Conquer approach

```
#include <iostream>
#include <climits>
using namespace std;

// Divide & Conquer solution to find minimum and maximum number in an array
void findMinAndMax(int arr[], int low, int high, int& min, int& max)
{
   // if array contains only one element

   if (low == high)          // common comparison
   {
      if (max < arr[low])   // comparison 1
         max = arr[low];

      if (min > arr[high])    // comparison 2
         min = arr[high];

      return;
   }

   // if array contains only two elements

   if (high - low == 1)        // common comparison
   {
      if (arr[low] < arr[high])    // comparison 1
      {
         if (min > arr[low])         // comparison 2
            min = arr[low];

         if (max < arr[high])    // comparison 3
            max = arr[high];
      }
      else
      {
```

```
            if (min > arr[high])    // comparison 2
                min = arr[high];

            if (max < arr[low])        // comparison 3
                max = arr[low];
        }
        return;
    }

    // find mid element
    int mid = (low + high) / 2;

    // recur for left sub-array
    findMinAndMax(arr, low, mid, min, max);

    // recur for right sub-array
    findMinAndMax(arr, mid + 1, high, min, max);
}

int main()
{
    int arr[] = { 7, 2, 9, 3, 1, 6, 7, 8, 4 };
    int n = sizeof(arr) / sizeof(arr[0]);

    // initialize the minimum element by infinity and the
    // maximum element by minus infinity
    int max = INT_MIN, min = INT_MAX;

    findMinAndMax(arr, 0, n - 1, min, max);

    cout << "The minimum element in the array is " << min << '\n';
    cout << "The maximum element in the array is " << max;

    return 0;
}
```

5. Find the minimum number of scalar multiplication needed for chain of matrix

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

// Matrix Ai has dimension p[i-1] x p[i] for i = 1..n

int MatrixChainMultiplication(int p[], int n)
{
   int m[n][n];
   int i, j, k, L, q;

   for (i=1; i<n; i++)
      m[i][i] = 0;    //number of multiplications are 0(zero) when there is only one
                      matrix

 //Here L is chain length. It varies from length 2 to length n.
   for (L=2; L<n; L++)
   {
      for (i=1; i<n-L+1; i++)
      {
         j = i+L-1;
         m[i][j] = INT_MAX;  //INT_MAX is a macro which is defined in
                                limit.h.THrough it maximum integer value can be
                                assigned in to m[i][j]

         for (k=i; k<=j-1; k++)
         {
            q = m[i][k] + m[k+1][j] + p[i-1]*p[k]*p[j];
            if (q < m[i][j])
            {
               m[i][j] = q;    //if number of multiplications found less that number
                                will be updated.
            }
         }
      }
   }
```

```
    return m[1][n-1];   //returning the final answer which is M[1][n]

}

int main()
{
    int n,i;
    printf("Enter number of matrices\n");
    scanf("%d",&n);

    n++;

    int arr[n];

    printf("Enter dimensions \n");

    for(i=0;i<n;i++)
    {
        printf("Enter d%d :: ",i);
        scanf("%d",&arr[i]);
    }

    int size = sizeof(arr)/sizeof(arr[0]);

    printf("Minimum number of multiplications is %d ",
                    MatrixChainMultiplication(arr, size));

    return 0;
}
```

Output

```
Enter number of matrices
4
Enter dimensions
Enter d0 :: 10
Enter d1 :: 100
Enter d2 :: 20
Enter d3 :: 5
Enter d4 :: 80
```

Minimum number of multiplications is 19000

6. Implement all pair of Shortest path for a graph (Floyd- War shall Algorithm)

```
#include<stdio.h>
int min(int,int);
void floyds(int p[10][10],int n)
{
 int i,j,k;
 for(k=1;k<=n;k++)
  for(i=1;i<=n;i++)
   for(j=1;j<=n;j++)
    if(i==j)
     p[i][j]=0;
    else
     p[i][j]=min(p[i][j],p[i][k]+p[k][j]);
}
int min(int a,int b)
{
 if(a<b)
  return(a);
 else
  return(b);
}
void main()
{
 int p[10][10],w,n,e,u,v,i,j;;
 printf("\n Enter the number of vertices:");
 scanf("%d",&n);
 printf("\n Enter the number of edges:\n");
 scanf("%d",&e);
 for(i=1;i<=n;i++)
 {
  for(j=1;j<=n;j++)
   p[i][j]=999;
 }
 for(i=1;i<=e;i++)
 {
  printf("\n Enter the end vertices of edge%d with its weight \n",i);
```

```
 scanf("%d%d%d",&u,&v,&w);
 p[u][v]=w;
}
printf("\n Matrix of input data:\n");
for(i=1;i<=n;i++)
{
 for(j=1;j<=n;j++)
  printf("%d \t",p[i][j]);
 printf("\n");
}
floyds(p,n);
printf("\n Transitive closure:\n");
for(i=1;i<=n;i++)
{
 for(j=1;j<=n;j++)
  printf("%d \t",p[i][j]);
 printf("\n");
}
printf("\n The shortest paths are:\n");
for(i=1;i<=n;i++)
 for(j=1;j<=n;j++)
 {
  if(i!=j)
   printf("\n <%d,%d>=%d",i,j,p[i][j]);
 }
                }
```

7. Implement Single Source shortest Path for a graph (Bellman Ford Algorithm)

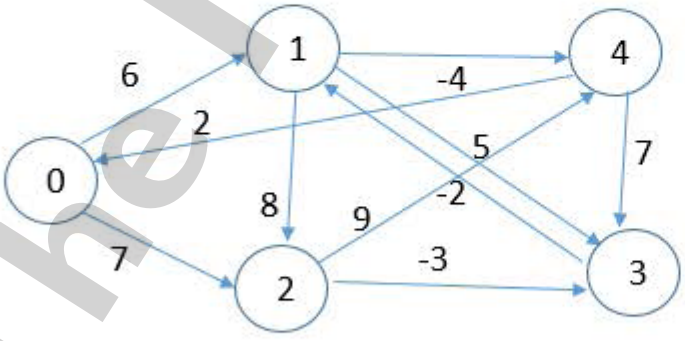
```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <limits.h>

struct Edge
{
   // This structure is equal to an edge. Edge contains two end points. These edges
                are directed edges so they
                //contain source and destination and some weight. These 3 are
                elements in this structure
   int source, destination, weight;
};

// a structure to represent a connected, directed and weighted graph
struct Graph
{
   int V, E;
                // V is number of vertices and E is number of edges

   struct Edge* edge;
                // This structure contain another structure which we already created
                edge.
};

struct Graph* createGraph(int V, int E)
{
   struct Graph* graph = (struct Graph*) malloc( sizeof(struct Graph));
                //Allocating space to structure graph

   graph->V = V;   //assigning values to structure elements that taken form user.

   graph->E = E;

   graph->edge = (struct Edge*) malloc( graph->E * sizeof( struct Edge ) );
```

```
                //Creating "Edge" type structures inside "Graph" structure, the
                number of edge type structures are equal to number of edges

    return graph;
}

void FinalSolution(int dist[], int n)
{
                // This function prints the final solution
    printf("\nVertex\tDistance from Source Vertex\n");
    int i;

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

void BellmanFord(struct Graph* graph, int source)
{
    int V = graph->V;

    int E = graph->E;

    int StoreDistance[V];

    int i,j;

    // This is initial step that we know , we initialize all distance to infinity except
                source.
                // We assign source distance as 0(zero)

    for (i = 0; i < V; i++)
        StoreDistance[i] = INT_MAX;

    StoreDistance[source] = 0;

    //The shortest path of graph that contain V vertices, never contain "V-1" edges.
                So we do here "V-1" relaxations
    for (i = 1; i <= V-1; i++)
    {
```

```
    for (j = 0; j < E; j++)
    {
        int u = graph->edge[j].source;

        int v = graph->edge[j].destination;

        int weight = graph->edge[j].weight;

        if (StoreDistance[u] + weight < StoreDistance[v])
            StoreDistance[v] = StoreDistance[u] + weight;
    }
}

// Actually upto now shortest path found. But BellmanFord checks for negative
                edge cycle. In this step we check for that
// shortest distances if graph doesn't contain negative weight cycle.

// If we get a shorter path, then there is a negative edge cycle.
for (i = 0; i < E; i++)
{
    int u = graph->edge[i].source;

    int v = graph->edge[i].destination;

    int weight = graph->edge[i].weight;

    if (StoreDistance[u] + weight < StoreDistance[v])
        printf("This graph contains negative edge cycle\n");
}

FinalSolution(StoreDistance, V);

return;
}

int main()
{
    int V,E,S;  //V = no.of Vertices, E = no.of Edges, S is source vertex

                printf("Enter number of vertices in graph\n");
```

```
    scanf("%d",&V);

                printf("Enter number of edges in graph\n");
    scanf("%d",&E);

                printf("Enter your source vertex number\n");
                scanf("%d",&S);

    struct Graph* graph = createGraph(V, E);    //calling the function to allocate
                space to these many vertices and edges

    int i;
    for(i=0;i<E;i++){
       printf("\nEnter edge %d properties Source, destination, weight
                respectively\n",i+1);
       scanf("%d",&graph->edge[i].source);
       scanf("%d",&graph->edge[i].destination);
       scanf("%d",&graph->edge[i].weight);
    }

    BellmanFord(graph, S);
                //passing created graph and source vertex to BellmanFord Algorithm
                function

    return 0;
}
```

For the Graph



Output

```
Enter number of vertices in graph
5
Enter number of edges in graph
10
Enter your source vertex number
0
Enter edge 1 properties Source, destination, weight respectively
0 1 6
Enter edge 2 properties Source, destination, weight respectively
0 2 7
Enter edge 3 properties Source, destination, weight respectively
1 2 8
Enter edge 4 properties Source, destination, weight respectively
1 4 -4
Enter edge 5 properties Source, destination, weight respectively
1 3 5
Enter edge 6 properties Source, destination, weight respectively
3 1 -2
Enter edge 7 properties Source, destination, weight respectively
2 3 -3
Enter edge 8 properties Source, destination, weight respectively
2 4 9
Enter edge 9 properties Source, destination, weight respectively
4 0 2
Enter edge 10 properties Source, destination, weight respectively
4 3 7
Vertex  Distance from Source Vertex
0  0
1  2
2  7
3  4
4  -2
```

8. Implement Single Source shortest Path for a graph (Dijkstra Algorithm)

```
#include<stdio.h>

#define MAX 100
#define NIL -1
#define infinity 9999
#define TEMPORARY 0
#define PERMANENT 1

void Path_Finder(int source, int vertex);
void Dijkstra_function(int source);
int minimum_temp();
void make_graph();

int vertices;
int adjacent_matrix[MAX][MAX];
int predecessor[MAX];
int vertex_status[MAX];
int pathLength[MAX];

int main()
{
    int source, vertex;
    make_graph();
    printf("Enter Source Vertex:\t");
    scanf("%d", &source);
    Dijkstra_function(source);
    while(1)
    {
        printf("Enter destination vertex(-1 to Quit):\t");
        scanf("%d", &vertex);
        if(vertex == -1)
        {
            break;
        }
        if(vertex < 0 || vertex >= vertices)
        {
```

```
            printf("The Entered Vertex does not exist\n");
        }
        else if(vertex == source)
        {
            printf("Source Vertex and Destination Vertex are same\n");
        }
        else if(pathLength[vertex] == infinity)
        {
            printf("There is no path from Source vertex to Destination vertex\n");
        }
        else
        {
            Path_Finder(source, vertex);
        }
    }
    return 0;
}

void Dijkstra_function(int source)
{
    int count, current;
    for(count = 0; count < vertices; count++)
    {
        predecessor[count] = NIL;
        pathLength[count] = infinity;
        vertex_status[count] = TEMPORARY;
    }
    pathLength[source] = 0;
    while(1)
    {
        current = minimum_temp();
        if(current == NIL)
        {
            return;
        }
        vertex_status[current] = PERMANENT;
        for(count = 0; count < vertices; count++)
        {
            if(adjacent_matrix[current][count] != 0 && vertex_status[count] ==
              TEMPORARY)
```

```
            {
              if( pathLength[current] + adjacent_matrix[current][count] <
            pathLength[count])
              {
                  predecessor[count] = current;
                  pathLength[count] = pathLength[current] +
            adjacent_matrix[current][count];
              }
            }
        }
    }
}

int minimum_temp()
{
    int count;
    int min = infinity;
    int x = NIL;
    for(count = 0; count < vertices; count++)
    {
        if(vertex_status[count] == TEMPORARY && pathLength[count] < min)
        {
            min = pathLength[count];
            x = count;
        }
    }
    return x;
}

void Path_Finder(int source, int vertex)
{
    int count, u;
    int path[MAX];
    int shortest_distance = 0;
    int temp = 0;
    while(vertex != source)
    {
        temp++;
        path[temp] = vertex;
        u = predecessor[vertex];
```

```
            shortest_distance = shortest_distance + adjacent_matrix[u][vertex];
            vertex = u;
        }
        count++;
        path[temp] = source;
        printf("Shortest Path\n");
        for(count = temp; count >= 1; count--)
        {
            printf("%d  ", path[count]);
        }
        printf("\nShortest distance:\t%d\n", shortest_distance);
}

void make_graph()
{
        int count, maximum_edges, origin_vertex, destination_vertex, weight;
        printf("Enter total number of vertices:\t");
        scanf("%d", &vertices);
        maximum_edges = vertices * (vertices - 1);
        for(count = 0; count < maximum_edges; count++)
        {
            printf("Enter Edge [%d] Co-ordinates [-1 -1] to Quit\n", count + 1);
            printf("Enter Origin Vertex Point:\t");
            scanf("%d", &origin_vertex);
            printf("Enter Destination Vertex Point:\t");
            scanf("%d", &destination_vertex);
            if((origin_vertex == -1) && (destination_vertex == -1))
            {
                break;
            }
            printf("Enter the weight for this edge:\t");
            scanf("%d", &weight);
            if(origin_vertex >= vertices || destination_vertex >= vertices || origin_vertex
                    < 0 || destination_vertex < 0)
            {
                printf("Edge Co - ordinates are Invalid\n");
                count--;
            }
            else
            {
```

```
                adjacent_matrix[origin_vertex][destination_vertex] = weight;
            }
        }
    }
```

9. Implement 8 Queen problem

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

int board[20],count;

int main()
{
int n,i,j;
void queen(int row,int n);

printf(" - N Queens Problem Using Backtracking -");
printf("\n\nEnter number of Queens:");
scanf("%d",&n);
queen(1,n);
return 0;
}

//function for printing the solution
void print(int n)
{
int i,j;
printf("\n\nSolution %d:\n\n",++count);

for(i=1;i<=n;++i)
  printf("\t%d",i);

for(i=1;i<=n;++i)
{
  printf("\n\n%d",i);
  for(j=1;j<=n;++j) //for nxn board
  {
   if(board[i]==j)
    printf("\tQ"); //queen at i,j position
   else
    printf("\t-"); //empty slot
  }
```

```
}
}

/*funtion to check conflicts
If no conflict for desired postion returns 1 otherwise returns 0*/
int place(int row,int column)
{
int i;
for(i=1;i<=row-1;++i)
{
 //checking column and digonal conflicts
 if(board[i]==column)
  return 0;
 else
  if(abs(board[i]-column)==abs(i-row))
   return 0;
}

return 1; //no conflicts
}

//function to check for proper positioning of queen
void queen(int row,int n)
{
int column;
for(column=1;column<=n;++column)
{
 if(place(row,column))
 {
  board[row]=column; //no conflicts so place queen
  if(row==n) //dead end
   print(n); //printing the board configuration
  else //try queen with next position
   queen(row+1,n);
 }
}
}
```

Note: It is a n-quine problem,. In the place of n, if you put value as 8, it will be 8 quine problem.

10. Implement Travelling Salesman problem

```
#include<stdio.h>

int matrix[25][25], visited_cities[10], limit, cost = 0;

int tsp(int c)
{
    int count, nearest_city = 999;
    int minimum = 999, temp;
    for(count = 0; count < limit; count++)
    {
        if((matrix[c][count] != 0) && (visited_cities[count] == 0))
        {
            if(matrix[c][count] < minimum)
            {
                minimum = matrix[count][0] + matrix[c][count];
            }
            temp = matrix[c][count];
            nearest_city = count;
        }
    }
    if(minimum != 999)
    {
        cost = cost + temp;
    }
    return nearest_city;
}

void minimum_cost(int city)
{
    int nearest_city;
    visited_cities[city] = 1;
    printf("%d ", city + 1);
    nearest_city = tsp(city);
    if(nearest_city == 999)
    {
        nearest_city = 0;
```

```
        printf("%d", nearest_city + 1);
        cost = cost + matrix[city][nearest_city];
        return;
    }
    minimum_cost(nearest_city);
}

int main()
{
    int i, j;
    printf("Enter Total Number of Cities:\t");
    scanf("%d", &limit);
    printf("\nEnter Cost Matrix\n");
    for(i = 0; i < limit; i++)
    {
        printf("\nEnter %d Elements in Row[%d]\n", limit, i + 1);
        for(j = 0; j < limit; j++)
        {
            scanf("%d", &matrix[i][j]);
        }
        visited_cities[i] = 0;
    }
    printf("\nEntered Cost Matrix\n");
    for(i = 0; i < limit; i++)
    {
        printf("\n");
        for(j = 0; j < limit; j++)
        {
            printf("%d ", matrix[i][j]);
        }
    }
    printf("\n\nPath:\t");
    minimum_cost(0);
    printf("\n\nMinimum Cost: \t");
    printf("%d\n", cost);
    return 0;
}
```

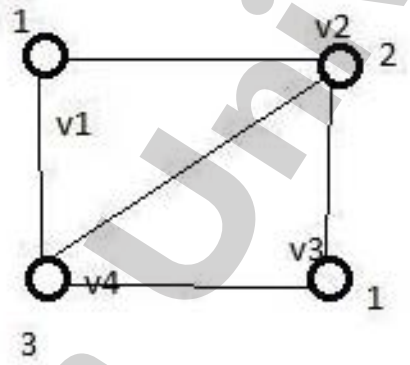
11. Implement Graph Coloring problem

```
#include<stdio.h>
int G[50][50],x[50];  //G:adjacency matrix,x:colors
void next_color(int k)
{
  int i,j;
  x[k]=1;  //coloring vertex with color1
  for(i=0;i<k;i++){ //checking all k-1 vertices-backtracking
                if(G[i][k]!=0 && x[k]==x[i])  //if connected and has same color
                  x[k]=x[i]+1;  //assign higher color than x[i]
  }
}

int main()
{
 int n,e,i,j,k,l;
 printf("Enter no. of vertices : ");
 scanf("%d",&n);  //total vertices
 printf("Enter no. of edges : ");
 scanf("%d",&e);  //total edges

 for(i=0;i<n;i++)
                for(j=0;j<n;j++)
                  G[i][j]=0;  //assign 0 to all index of adjacency matrix

 printf("Enter indexes where value is 1-->\n");
 for(i=0;i<e;i++)
 {
                scanf("%d %d",&k,&l);
                G[k][l]=1;
                G[l][k]=1;
 }

 for(i=0;i<n;i++)
                next_color(i);  //coloring each vertex

 printf("Colors of vertices -->\n");
 for(i=0;i<n;i++)  //displaying color of each vertex
```

```
            printf("Vertex[%d] : %d\n",i+1,x[i]);

 return 0;
}
```

NOTE : This code is written, compiled and run with GCC compiler under Linux environment Ubuntu12.04LTS Precise Pangolin.

Out put for the graph



Colored vertices of Graph G

```
Enter no. of vertices : 4
Enter no. of edges : 5
Enter indexes where value is 1-->
0 1
1 2
1 3
2 3
3 0
Colors of vertices -->
Vertex[1] : 1
Vertex[2] : 2
Vertex[3] : 1
Vertex[4] : 3
```

12. Implement Job sequencing with deadlines problem

```
#include <stdio.h>

#define MAX 100

typedef struct Job {       // Using typedef, we can add new name of a datatype
  char id[5];
  int deadline;
  int profit;
} Job;
void jobSequencingWithDeadline(Job jobs[], int n);

int minValue(int x, int y) {
  if(x < y) return x;
  return y;
}

int main(void) {
  //variables
  int i, j;

  //jobs with deadline and profit
  Job jobs[5] = {
    {"j1", 2,  60},
    {"j2", 1, 100},
    {"j3", 3,  20},
    {"j4", 2,  40},
    {"j5", 1,  20},
  };

  //temp
  Job temp;

  //number of jobs
  int n = 5;

  //sort the jobs profit wise in descending order
  for(i = 1; i < n; i++) {
    for(j = 0; j < n - i; j++) {
```

```
      if(jobs[j+1].profit > jobs[j].profit) {
        temp = jobs[j+1];
        jobs[j+1] = jobs[j];
        jobs[j] = temp;
      }
    }
  }

  printf("%10s %10s %10s\n", "Job", "Deadline", "Profit");
  for(i = 0; i < n; i++) {
    printf("%10s %10i %10i\n", jobs[i].id, jobs[i].deadline, jobs[i].profit);
  }

  jobSequencingWithDeadline(jobs, n);

  return 0;
}

void jobSequencingWithDeadline(Job jobs[], int n) {
  //variables
  int i, j, k, maxprofit;

  //free time slots
  int timeslot[MAX];

  //filled time slots
  int filledTimeSlot = 0;

  //find max deadline value
  int dmax = 0;
  for(i = 0; i < n; i++) {
    if(jobs[i].deadline > dmax) {
      dmax = jobs[i].deadline;
    }
  }

  //free time slots initially set to -1 [-1 denotes EMPTY]
  for(i = 1; i <= dmax; i++) {
    timeslot[i] = -1;
  }
```

```
printf("dmax: %d\n", dmax);

for(i = 1; i <= n; i++) {
  k = minValue(dmax, jobs[i - 1].deadline);
  while(k >= 1) {
    if(timeslot[k] == -1) {
      timeslot[k] = i-1;
      filledTimeSlot++;
      break;
    }
    k--;
  }

  //if all time slots are filled then stop
  if(filledTimeSlot == dmax) {
    break;
  }
}

//required jobs
printf("\nRequired Jobs: ");
for(i = 1; i <= dmax; i++) {
  printf("%s", jobs[timeslot[i]].id);

  if(i < dmax) {
    printf(" --> ");
  }
}

//required profit
maxprofit = 0;
for(i = 1; i <= dmax; i++) {
  maxprofit += jobs[timeslot[i]].profit;
}
printf("\nMax Profit: %d\n", maxprofit);
}
```

13. Implement Longest Common Subsequence problem

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

int i,j,m,n,c[20][20];
char x[20],y[20],b[20][20];

void print(int i,int j)
{
        if(i==0 || j==0)
                return;
        if(b[i][j]=='c')
        {
                print(i-1,j-1);
                printf("%c",x[i-1]);
        }
        else if(b[i][j]=='u')
                print(i-1,j);
        else
                print(i,j-1);
}

void lcs()
{
        m=strlen(x);
        n=strlen(y);
        for(i=0;i<=m;i++)
                c[i][0]=0;
        for(i=0;i<=n;i++)
                c[0][i]=0;

        //c, u and l denotes cross, upward and downward directions respectively
        for(i=1;i<=m;i++)
                for(j=1;j<=n;j++)
                {
                        if(x[i-1]==y[j-1])
                        {
                                c[i][j]=c[i-1][j-1]+1;
```

```
                    b[i][j]='c';
                }
                else if(c[i-1][j]>=c[i][j-1])
                {
                    c[i][j]=c[i-1][j];
                    b[i][j]='u';
                }
                else
                {
                    c[i][j]=c[i][j-1];
                    b[i][j]='l';
                }
            }
}
int main()
{
    printf("Enter 1st sequence:");
    scanf("%s",x);
    printf("Enter 2nd sequence:");
    scanf("%s",y);
    printf("\nThe Longest Common Subsequence is ");
    lcs();
    print(m,n);
      return 0;
}
```