Khemis Miliana University

Faculty of Science and Technology

Mathematics and Computer Science Department

جامعة جيلالي بونعامة– خميس مليانة

كلية العلوم والتكنولوجيا

قسم الرياضيات و الاعلام الالي

Module : Operations Research 1

Responsible: Dr. I. Ait Abderrahim

Tutorial sheet 6

Problem: Thief optimization

Task: /* C++ Program to Implement Traveling Salesman Problem using Nearest neighbour Algorithm*/

Solution: C++

```
#include<stdio.h>
#include<conio.h>
#include<iostream>
using namespace std;
int c = 0,cost = 999;
int graph[4][4] = { {0, 10, 15, 20},
                    {10, 0, 35, 25},
                    {15, 35, 0, 30},
                    {20, 25, 30, 0}};
void swap (int *x, int *y)
{
    int temp;
    temp = *x;
    *x = *y;
    *y = temp;
}
void copy_array(int *a, int n)
{
    int i, sum = 0;
    for(i = 0; i <= n; i++)
    {
        sum += graph[a[i % 4]][a[(i + 1) % 4]];
    }
    if (cost > sum)
    {
        cost = sum;
    }
}
void permute(int *a, int i, int n)
{
   int j, k;
   if (i == n)
   {
        copy_array(a, n);
   }
   else
   {
        for (j = i; j <= n; j++)
        {
            swap((a + i), (a + j));
            permute(a, i + 1, n);
            swap((a + i), (a + j));
        }
    }
}
int main()
{
   int i, j;
   int a[] = {0, 1, 2, 3};
   permute(a, 0, 3);
   cout<<"minimum cost:"<<cost<<endl;
   getch();
}
```

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Solution: Python

```
def swap(x, y):
    temp = x
    x = y
    y = temp

def copy_array(a):
    global cost
    sum = 0
    for i in range(len(a)):
        sum += graph[a[i % 4]][a[(i + 1) % 4]]
    if cost > sum:
        cost = sum

def permute(a, i, n):
    if i == n:
        copy_array(a)
    else:
        for j in range(i, n + 1):
            swap(a[i], a[j])
            permute(a, i + 1, n)
            swap(a[i], a[j])

c = 0
cost = 999
graph = [[0, 10, 15, 20],
         [10, 0, 35, 25],
         [15, 35, 0, 30],
         [20, 25, 30, 0]]

a = [0, 1, 2, 3]
permute(a, 0, 3)

print("minimum cost:", cost)
```