Assignment 4

Submission Date: 23 January 2020, 06:00 AM
Submission Mode: Soft-copy / MS Teams

- **You have to submit a single .py file**. Make sure the file name of your submitted must be your roll number.
- You are provided a file as a template. You can use the file for your solution.
- Make sure that function names must be similar as asked in the assignment.
- You must read Academic Integrity at the end of this document.

Graph Theory

Scenario

UIT and many other universities nationwide are doing a joint project on multimedia. A computer network is built to connect these universities using communication links that construct a graph. The universities decided to install a file server at UIT Karachi to share data. As the link's transmission time is controlled by the link setup and management. so, the cost of a data transfer is directly proportional to the number of links consumed. The target is that UIT Karachi desired to share data with NUST Islamabad by utilizing minimum cost.

Draw a graph with the help of these unweighted graph arcs and analyze an algorithm to compute the minimum cost path for sharing of data between UIT Karachi and NUST Islamabad and its cost.

NUST Islamabad --> UIT Karachi

UIT Karachi <--> UET Lahore

UET Lahore <--> BZU Multan

NUST Islamabad <--> BZU Multan

UET Lahore <--> Faisalabad Uni

Faisalabad Uni <--> BZU Multan

Implementation

Data structure

You have to implement the graph by applying a dictionary data structure to hold the vertices and edges in the form of key: value pairs

SharedData

This class consists of functions that are responsible for creating a graph, calculating the most cost-efficient path between UIT Karachi and NUST Islamabad, and compute its cost.

```
class SharedData:

def __init__(self):
        pass

# create a graph of universities with the help of a dictionary
# return the created graph named graph
def build_graph(self):
     return graph

# calculate the cost-efficient path from the graph
# return mincostpath in the form of list
# start and end consists of initial and final locations
def minimum_cost_path(self, graph, start, end, path=[])
     # path=[] intiate populating it from the start
     # Use for loop to iterate on a graph
           #recursive call of this function
     return mincostpath

# calculate the cost along the minimum cost path
def calculate_cost(self, mincostpath):
    #calculate the cost based on edges
     return pathcost

The testing code must print the following output:
The cost-efficient path b/w UIT Karachi & NUST Islamabad is:
['UIT Karachi', 'UET Lahore', 'BZU Multan', 'NUST Islamabad']
The cost along this path is: 3
```

Academic Integrity

Each student in this course is expected to make sure that any work submitted by a student in this course for academic credit will be the **student's own work**. Scholastic dishonesty shall be considered a serious violation of these rules and regulations and is subject to strict disciplinary action. Scholastic dishonesty includes, but is not limited to, cheating on exams, plagiarism on assignments, and collusion.

PLAGIARISM: Plagiarism is the act of taking the work created by another person or entity and presenting it as one's own for the purpose of personal gain or of obtaining academic credit. Plagiarism includes the submission of or incorporation of the work of others without acknowledging its provenance or giving due credit according to established academic practices. This includes the submission of material that has been appropriated, bought, received as a gift, downloaded, or obtained by any other means. Students must not, unless they have been granted permission from all faculty members concerned, submit the same assignment or project for academic credit for different courses.

CHEATING: The term cheating shall refer to the use of or obtaining of unauthorized information in order to obtain personal benefit or academic credit.

COLLUSION: Collusion is the act of providing unauthorized assistance to one or more person or of not taking the appropriate precautions against doing so. Any student caught violating academic integrity will suffer an academic penalty. All violations of academic integrity will also be immediately reported to the Disciplinary Committee. Any student violating academic integrity a second time in this course will receive a failing grade for the course, and additional disciplinary sanctions may be administered through the Disciplinary Committee.

Conclusively, each student needs to take care of:

1. You must not share your solutions with other students. You are encouraged to discuss the problems but each student is supposed to take care of his or her own solution.
2. You must not submit solution of other students as yours.
3. You must duly cite all resources you used in development of your solution.