TASK 5: ALGORITHMS

APPROACH:

Firstly I made a DataFrame of all the 3 input files. Then in the “flights” dataframe I added 2 more columns , “OCCUPIED” and “VACANT” so as to know actually how many people were going to sit in the canceled flights and how much vacant space is available in other flights to accommodate them. By this I calculated the “Affected “ for the “stats” file.

Then by the “NetworkX” library I made a MultiDigraph in which the departure and arrival points were the nodes, and added FID as the edge key, and added edge attributes: "DEP_TIME", "ARR_TIME","FID","CAPACITY".After that I removed all the edges with edge keys corresponding to FID of cancelled flights.

Then I made a function to get the capacity of a path which is the minimum of the “VACANT” of all the flights of the path.

Then by ”nx.all_simple_edge_paths” I calculated all the paths between the source and destination of the cancelled flights with maximum number of edges=3(<= 3 layovers).

Now I filtered and sorted the paths based on the given priorites and constraints.

Firstly, at any port, the difference between the departure time and arrival time of next flight should be >= 3hours (i.e. 10800 epochs) so that layover is big enough for the passengers to deboard their first flight, make their way through the airport, and onto the second flight and the capacity of path should be greater than 0 . Then I sorted them by a custom sort function giving first priority to that the time to reach the destination should be <= the arrival time of cancelled flight, second to the number of layoffs, and third to how close the flight arrives to the arrival time of cancelled flight. For each cancelled flight I made this sorted list and then finally added all those lists to a list all_valid_paths.
Then for convenience I made a list “occupied” which contained the number of passengers of each cancelled flight.

Then for ALLOCATION :

Firslty I maintained a “set” in which I added the FID of all the flights of the path I traversed and for every path first I checked wether any of the FID of the path is present in the set if yes I ignored the path and move to the next path of the list so as to ensure that my code is not using the same flight twice for allocation.

Now for each cancelled flight , I traversed through the list of the sorted valid paths and once I used a path I subtracted the capacity of the path from the occupied list as those number of passengers have now been allocated. In this process only I calculated the time difference , number of layoffs, and also filled the entries for allot.csv.

I also had an alternative approach which was more efficient in terms of passengers reallocated.

In this I will traverse all the list of possible paths of cancelled flights simultaneously and if any of the path for the two canceled flights intersect , I will give that path to that flight which has more value of (occupied-total capacity) here occupied is the number of passengers who are not yet allocated and total capacity is the capacity of all subsequent paths left for the passengers of that cancelled flight , and if equal , I will allot the passengers equally from both flights.

ROADBLOCKS

I was new to NetworkX so I had difficulty initially in using its functions