HOMEWORK 5 INDR 460

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Que 1. Consider the following table, which presents the approximate flight time (in minutes including connections) between each pair of cities:

Part c) Suggest and implement a heuristic method to find a feasible tour for the given problem. What is the optimality gap your algorithm achives?

Ans c) We can use formulate this problem as Travelling Salesman Problem.
Let x_{ij} be the binary variable which denotes the presence of arc from i^{th} node to j^{th} node.
Then we would have constraints :

1) Each node should be entered once:

$$\sum_{(i,j)\in A} x_{ij} = 1 \quad \forall\, i \in V$$

2) Each node should be entered once:

$$\sum_{(j,i)\in A} x_{ij} = 1 \quad \forall\, i \in V$$

Other type of constraints would be to eliminate subtour/subpaths: which is also named as Dantzig-Fulkerson-Johnson (DFJ) constraints.
These constraints are not added directly instead we would solve a relaxed problem with constraint 1 and constraint 2 and we would find cycles in our graph and then according to it we would add DFJ constraint for eliminating those subtours and then we again solve with new set of constraints, this is done number of times until no subtours left in fincal solution.

Final Solution:
Flight schedule: Istanbul -> Izmir -> Adana -> Ankara -> Erzurum -> Istanbul
Total flight time: 60+80+60+75+110 = 385 minutes

The same is implemented in code with:
Node 1: Istanbul
Node 2: Ankara
Node 3: Erzurum
Node 4: Adana
Node 5: Izmir

Que 2) Consider the three network instances (Networks A, B and C) given in the attached TSPdata.xlxs file.

Ans 2.a)

	Optimal Solution(distance)	Number of Cuts
15 Nodes	390.677	7
30 Nodes	483.785	19
50 Nodes	609.100	35

Ans 2.b)

	Best 1-Tree lower bound
15 Nodes	354.174
30 Nodes	422.351
50 Nodes	524.367