Boğaziçi University
Department of Industrial Engineering
IE 441 Planning for Engineers

Assignment 2: Fleet Assignment Models

You are working as a planner for a newly formed airline company Medusa. Medusa is a short-haul discount airline. Medusa can lease up to 2 Boeing 737-800 and 2 Airbus A320. The relevant data for each of these aircraft types are as follows:

Aircraft Type	Boeing 737-800	Airbus A320
Seats	**108**	150
Turn Time	30 min	35 min

Medusa airlines flies between three airports: A, B and C. The relevant data for each flight leg is contained in the following schedule table:

Flight Number	**Origin**	**Destination**	**Departure**	**Arrival**
301	A	B	8:30AM	10:15AM
102	C	B	9:00AM	10:30AM
101	B	C	11:00AM	12:30PM
302	B	A	2:00PM	3:45PM
201	C	A	2:15PM	3:15PM
202	A	C	4:30PM	5:30PM

1. Draw the daily timeline network from each aircraft type and compute the number of flight assignment and ground variables of the **basic Fleet Assignment Model (FAM).**
2. Draw the daily timeline network with maximal feasible **node consolidation** (i.e., combine event nodes without losing information) and compute the number of flight assignment and ground variables of the FAM**.**
3. Write the integer programming constraints of the basic FAM for the node-consolidated network.

You are given the following data:

Flight Number	Number of Passengers	Average Fare	Operating Cost	
			B737-800	A320
301	150	₺425	₺42.000	₺54.000
102	160	₺420	₺36.000	₺52.000
101	180	₺410	₺36.000	₺52.000
302	150	₺408	₺42.000	₺54.000
201	140	₺620	₺24.000	₺36.000
202	120	₺625	₺24.000	₺36.000

4. Assume for now that all the passengers are locals (they fly on one flight only). Calculate the objective coefficients of the basic Fleet Assignment Model (FAM), which minimizes the sum of the operating costs and the spill costs, and find the optimal solution using Coliop-Cmpl.

5. In reality, some passengers are connecting at airport B. The passenger itinerary information is given below:

No	From	To	Itinerary	Number of Passengers	Fare
1	A	B	301	90	₺450
2	A	C	301 - 101	60	₺800
3	C	B	102	90	₺450
4	C	A	102 - 302	70	₺800
5	B	C	101	120	₺450
6	B	A	302	80	₺450
7	C	A	201	140	₺700
8	A	C	202	120	₺700

Solve the **Itinerary-Based Fleet Assignment Model (IFAM)** with **no recapture** using Coliop-Cmpl.

6. Compare and comment on the profitability of FAM and IFAM fleet assignment solutions.
7. You are given the additional information that 30% of the passengers originally scheduled on flights 301 and 101 (itinerary no 2) but who are spilled, accept to be re-accommodated on flight 202 (itinerary no 8). Can you tell, without resolving the problem if this might improve the fleet assignment solution found in question 5?