CUFE-AEM-Spring24

AEMN323 Air Transport System Analysis.

[Project, weight 15% of the whole grade]

ISD-IFAM Problem:

Project Outlines:

The project main objective is to model, implement, and solve the Integrated Schedule Design with the Itinerary-based Fleet Assignment Model ISD-IFAM to simulate a practical airline's activity. Groups may be formed from 3-5 students. The problem can be implemented on MATLAB or any other programming language.

Intended Learning Outcomes (ILOs):

1- Modeling the objective function with its components
2- Using the proper constraints for a real fleet assignment problem.
3- Modeling the optimization problem on a commercial solver.
4- Varying the constraints to realize the effect of each and to correlate their impacts on the optimized results.
5- Reporting the results technically.

Problem Statement:

The following is just a case study to verify your code. Do your best to develop a generic code so that it can be used by various airlines.

Figure 1 shows the flight schedule of a hypothetical airline that consists of six flights serving between three stations LAX, ORD, and BOS. The six flights represent the set of master flights. Flights $f1, f3, f5$, and $f6$ are assumed to be mandatory, while flights $f2$ and $f4$ are optional. The network includes a total of eight itineraries, The passenger demand and average fare of each itinerary are given in Table 1.

Assume that each of these six flights can be assigned to aircraft of fleet types $e1$ or $e2$ with seat capacity of 150 and 250 seats, respectively. The two aircraft types are assumed to have the same speed. Thus, each flight has the same arrival time regardless of its assigned fleet.

The operating cost of each of the six flights considering the two fleet types are given in Table 2.

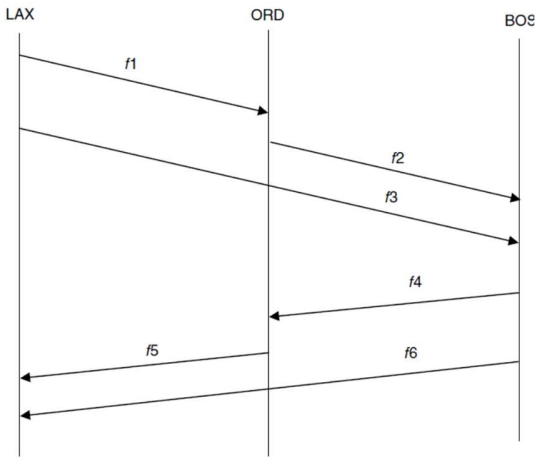

Fig. 1

Table1: The passenger demand and fares on each of the eight itineraries for the ISD-IFAM problem.

Itinerary	LAX-ORD	ORD-BOS	LAX-BOS	BOS-ORD	ORD-LAX	BOS-LAX	LAX-ORD-BOS	BOS-ORD-LAX
Passenger demand	50	50	300	50	50	300	50	50
Fare ($)	200	225	350	225	200	350	300	300

Table2: The operating cost of each flight for each fleet type for the ISD-IFAM problem.

		Fleet	
Flight		*e*1 ($)	*e*2 ($)
LAX-ORD	$f1$	30,000	16,600
ORD-BOS	$f2$	15,100	13,500
LAX-BOS	$f3$	15,500	45,000
BOS-ORD	$f4$	57,000	13,500
ORD-LAX	$f5$	42,000	16,600
BOS-LAX	$f6$	15,500	45,000

Hints:

- **Assume reasonable quantities for the demand correction factors ΔD_q^p due to cancelation of optional flights. Try to vary ΔD_q^p factors and comment on the effect on the optimal solution.**
- **Any missing data should be reasonably assumed.**

Tasks Outcomes and Evaluation:

1- Modeling the problem and stating the problem parameters in light of objective function and constraints. (20%)
2- Implementing the problem on MATLAB or any programming tool. (40%).
3- Reporting the problem and the result technically in an Engineering Format. [+Discussion if needed] (20%)
4- A total 7~10 minutes video recording for the whole group where each student showcases their individual contributions to the project, with your face appearing on the side of the screen as you speak. N.B.: 80% of project evaluation will be on your individual contribution. 20% of project evaluation will be on group work and consistency between group members.
5- Implementing the problem on a commercial aviation management package is a plus [Bonus].

- Project Expected working time [15-20 working hours]
- **Project submission due date Monday May, 20th, 2024.**
- ***Project deliverables: a drive link including the final report (word and PDF formats) + the solver file(s) + Presentation ppt + max. 10-minutes video.***

Good Luck,,,