Assignment 8: Airport Demand Estimation and Runway Throughput
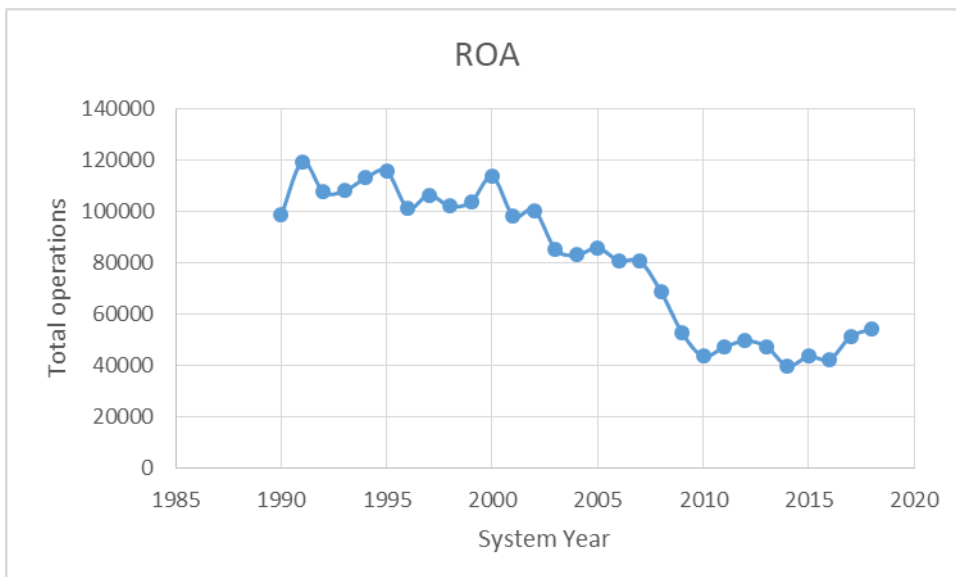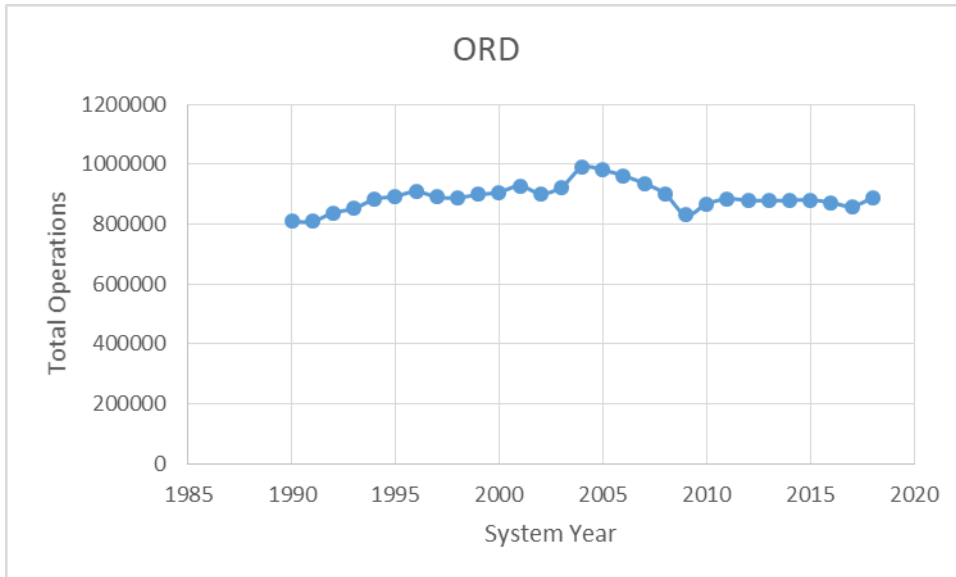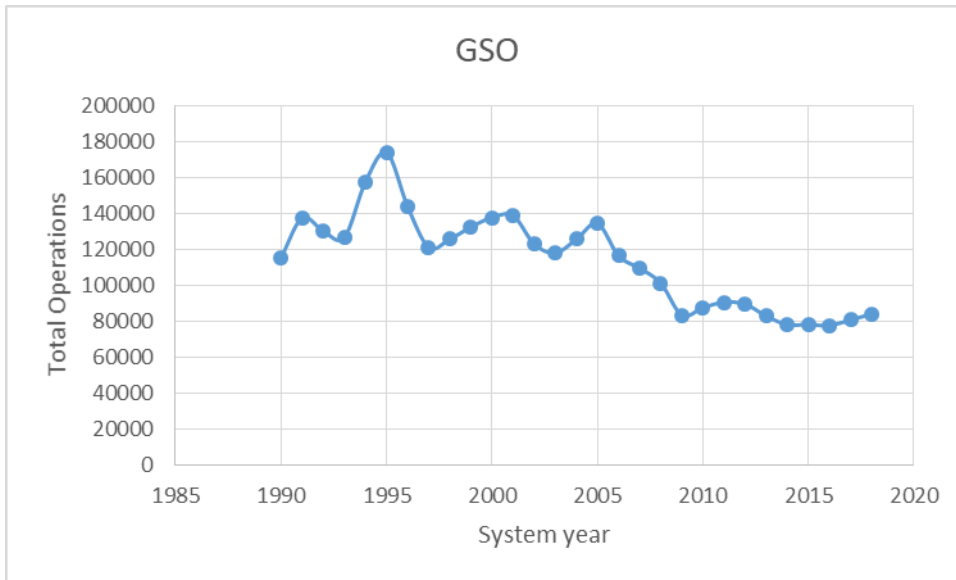
Solution

Problem 1

a) Use the FAA Terminal Area Forecast (https://taf.faa.gov) to explain the growth of passenger enplanements and number of total operations (itinerant plus local) of the following airports: 1) ORD, 2) ROA and 3) GSO.

b) Plot the historical number of total operations as a function of time.

GSO

c) Calculate the growth of flight operations at every airport between 1990 and 2016. Comment on which airport grew the most.

Growth of flight operations between 1990 to 2016		
ORD	ROA	GSO
62373 (7.15%)	-56089 (-132%)	-37769 (-48.69%)

From the table, it is clear that ORD airport experienced a positive growth in flight operations.

d) For Chicago ORD, estimate the average number of passengers per flight in years 1990, 2016 and 2045. Comment on the trend observed considering the number of flight operations plotted in part (b).

Average number of passengers per flight	
1990	69.0
2016	85.6
2045	106.0

With growing passenger at ORD, the average number of passengers per flight has increased.

e) Explain why in some years, the number of flights decreased.
There was a reduction in demand for all three airports from year 2007 to year 2009 because of the economic crisis. For example, at ROA: U.S. Airways Express eliminated non-stop service to Baltimore, Charlottesville, Dayton, Pittsburgh and Washington-Reagan since 1990, [23]. Northwest Airlink eliminated service to Newark in December 1992, [28]. Delta eliminated service to Cincinnati (via Chautauqua Airlines) in September 2008.[29. In 2010, Delta and Northwest Airlink merged, which also reduced the number of commercial operations at ROA.
At GSO airport : Eastern Airlines shutdown in January 1991. In 1993, Continental Lite, an LCC brand established an unsuccessful hub at PTI. By 1995 the hub lost its parent company, Continental Airlines. Gordon Bethune, the CEO of Continental at the time, ordered that hub to be abandoned .[7]

Problem 2

Use the FAA Terminal Area Forecast (https://taf.faa.gov) to find the best Logistic curve regression for the number of enplanements at Miami International Airport (MIA). This analysis requires use of Excel Solver.

a) Plot the historical number of total operations as a function of time.

MIA
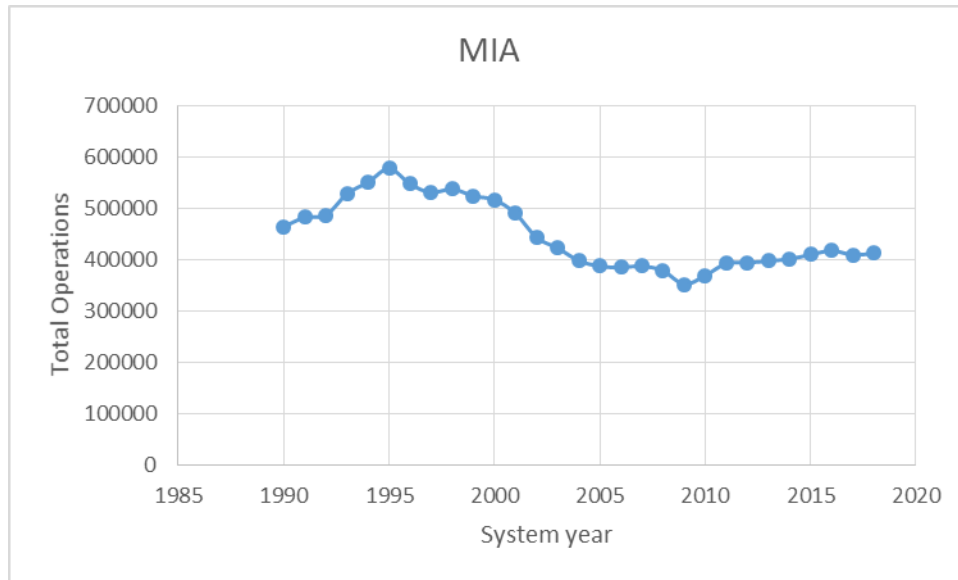
b) Calculate the values of coefficients a and b in the logistic model. The airport is expanding and building better passenger terminal infrastructure. The airport authority predicts that after all terminal improvements planned to the airport the facility should be able to handle up to 32 million enplanements per year in the future.

Logistic Model Parameters are shown in the table below.

SSE		
3.30809E+14		
	a	0.06
	b	2.24
	k	32000000

c) Comment on the goodness of the logistic model vs. the data. Plot the historical data vs. the logistic curve obtained in step (b) to make meaningful comparisons.

MIA
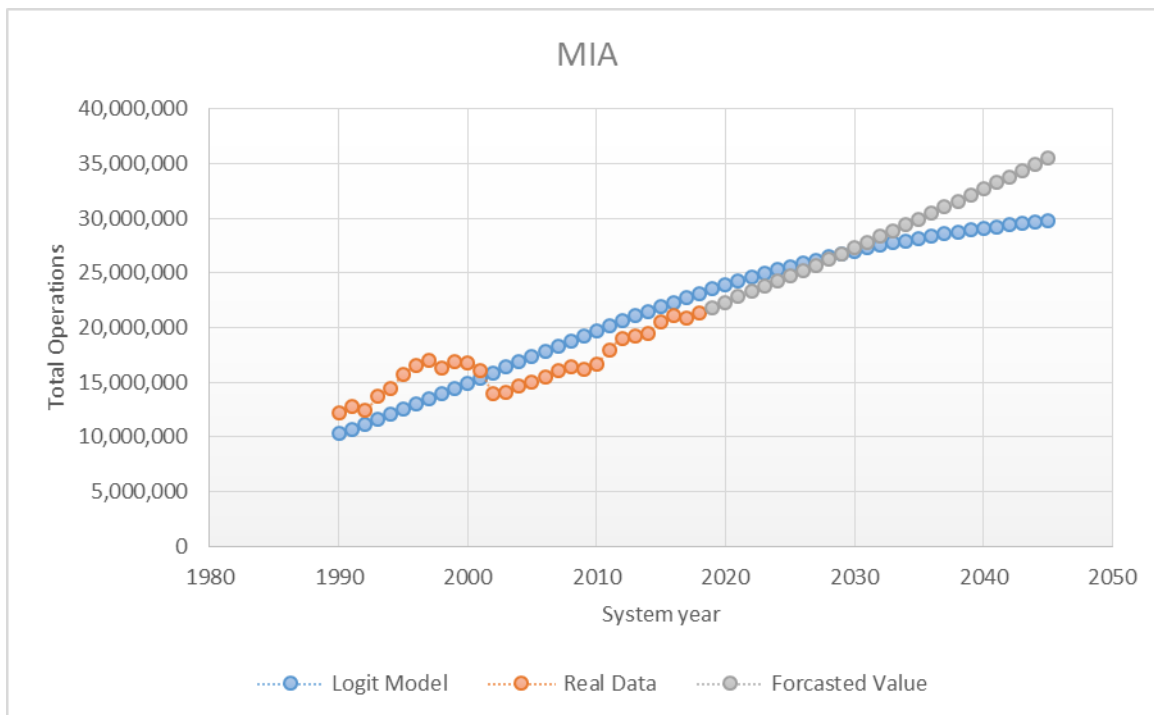
Problem 3

An internet application to show communities around airports the extend of their operations is shown in Figure 1. The application is called Webtrak (http://webtrak5.bksv.com/lax4). This application shows flight operations to an airport. Study the airport configuration for Los Angeles International airport (https://www.faa.gov/airports/runway_safety/diagrams/). Normally, arrivals are conducted on runways 24R (Northern runway) and runway 25L (Southern runway). Departures on runways 24L and runway 25R. LAX is reconstructing runway 25R so runway 25L is taking departures on the South.
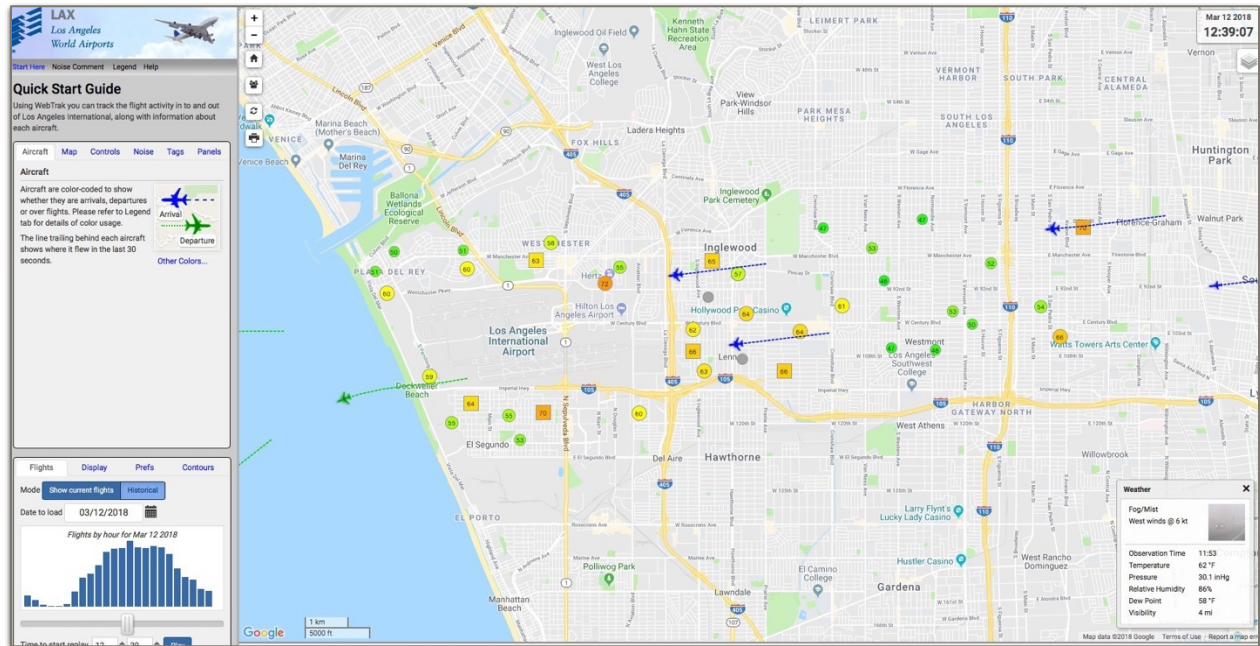

Figure 1. Webtrak system for Los Angeles International Airport. Departures are shown in Green. Arrivals in Blue. Airport Weather Conditions Panel Shown at the Lower Right Viewport. Replay Panel on the Lower Left.

a) Use the replay feature in Webtrak5 to estimate the total number of hourly landing operations between 13:00-14:00 hrs (i.e., throughput) at LAX runway 24R airport on March 12, 2018.

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b) Use the replay feature in Webtrak5 to estimate the total number of hourly departure operations at LAX 24L airport during the period 13:00-14:00 hrs.

36

c) If the hourly arrivals and departures estimated in parts (a) and (b) represent maximum runway throughput or capacities, estimate the runway capacity of the airport in West flow configuration with arrivals on runways 24R, 25L and departures on runways 24L and 25R. For this part, assume runway 25R has been reconstructed.

Two groups of dependent arrival and departure runways at LAX provide an observed throughput of 124 operations per hour. Note that this is not the the maximum throughput of the airport because there are some days with higher demand than the day observed for this problem.

$$Capacity = (26 + 36) * 2 = 124$$