CE 490: Pavement and Fleet Size Assignment

1) A two-lane highway has a current traffic of 5,000 vehicles per day in each direction with 80% passenger cars with 2 kip/axle weight, 15% two-axle trucks with a 10 kip/axle load and 5% tandem trucks. The tandem trucks have 5 axles and have loads of 34 kips on the rear axle pair, 30 kips on the middle pair and 12 kips on the front axle.

Traffic is expected to grow at a rate of 1.0% per year for the twenty year life of a proposed 8” concrete pavement.

   a) What is the average daily ESAL over the project life of the pavement? (use tables in the book)

   b) What working stress in concrete is required for the pavement if the modules of subgrade reaction is 200 psi (use WDOT nomographs)?

For fleet size problems you will need to understand the relationships which allows you to calculate fleet size as a function of vehicle capacity (C), terminal time at both origin and destination terminals (T1 and T2), average speed (S), distance (L), and total quantity to be moved.

\[ L \]
\[ T1 \]
\[ T2 \]

1) Assume the shipment of oranges to a port. 200,000 tons must be shipped in 30 working days (24 hours per day) by trucks with a capacity of 30 tons each. Loading time is 2 hours, travel time is 3 hours each way (150 miles @ 50 mph), while unloading time varies from 5 to 20 hours depending on port congestion. Show fleet size (as a chart) as a function of unloading time (5, 10, 15 and 20 hour terminal delays). Also show the total cost of the movement as a function of terminal delay; assume truck costs are $50/hour.

2) Using a time-space diagram, determine daily schedules and fleet size to accommodate a peak demand of 200 passengers per hour and a total of 1200 passengers per day each way between Milwaukee and Detroit (300 miles) using the following aircraft:

   B-717 type aircraft (100 seats, 600 mph)

   Assume a 2 hour terminal time at each terminal. Service should have arrivals or departures between the hours of 7:00 a.m. and 10:00 p.m. local time and operate on a regular schedule (i.e. same departure time each day). Assume the peak is between 8 and 9:00 am in each city. Show schedules in local time (Detroit is one hour ahead of Milwaukee)

Due April 28, 2005