CEE 123 Transport Systems 3: Planning & Forecasting

Spring 2025: [15450]

Homework 8. Trip Assignment Modeling

The following problems deal with a hypothetical, 4-zone region (this data was used in prior homework assignments). Table 1 summarizes activity system and **HBW** trip generation data (Ps and As) for 2020, and estimates of activity system variables for 2030. **Use the Table 2 base Trip Distribution in all problems**.

Table 1. Base and Future HBW Trips and Demographic Data Summary

	HBW		HH(i)		C(i)		W(i)		E(j)		I(i)
	P(i)	A(j)	Households		Cars		Workers		Empl.		Inc.
Zone	'20	'20	'20	'30	'20	'30	'20	'30	'20	'30	both
1	825	710	321	330	447	460	390	395	300	300	Low
2	775	800	402	470	360	420	345	480	360	450	Med
3	910	970	330	300	396	375	582	570	600	690	High
4	865	895	375	420	450	465	399	450	456	455	Med
Tot	3375	3375	1428	1520	1653	1720	1716	1895	1716	1895	N/A

Table 2. Base Travel Time and Trip Distribution Tables

From\To	1	2	3	4	From\To	1	2	3	4	P(i)
1	5	16	13	18	1	250	125	375	75	825
2	16	7	20	12	2	100	400	50	225	775
3	13	20	2	9	3	205	60	225	420	910
4	18	12	9	3	4	155	215	320	175	865
					A(j)	710	800	970	895	3375

Problem 8. Trip Assignment (20 points)

Assign total AM-peak vehicle demand to the network based on minimum time paths and All-or-Nothing (AON) Assignment. Use the estimated HBW O-D vehicle trip table from Problem 6 and the HBO and NHB tables provided in Table 8. Show all work, including an **assignment table** and a **network map** of assigned link volumes (use *desire lines* and/or annotated links).

Table 8. HBO and NHB AM-peak Vehicle-trip OD Tables

	HBO					NHB				
Fr\To	1	2	3	4	O(i)	1	2	3	4	O(i)
1	30	18	53	9	110	5	5	18	2	30
2	12	54	7	27	100	6	50	8	6	70
3	44	15	56	95	210	16	9	42	13	80
4	29	48	69	34	180	2	6	11	1	20
Tot	115	135	185	165	600	29	70	79	22	200

Problem 9. Trip Assignment: Updating (10 points)

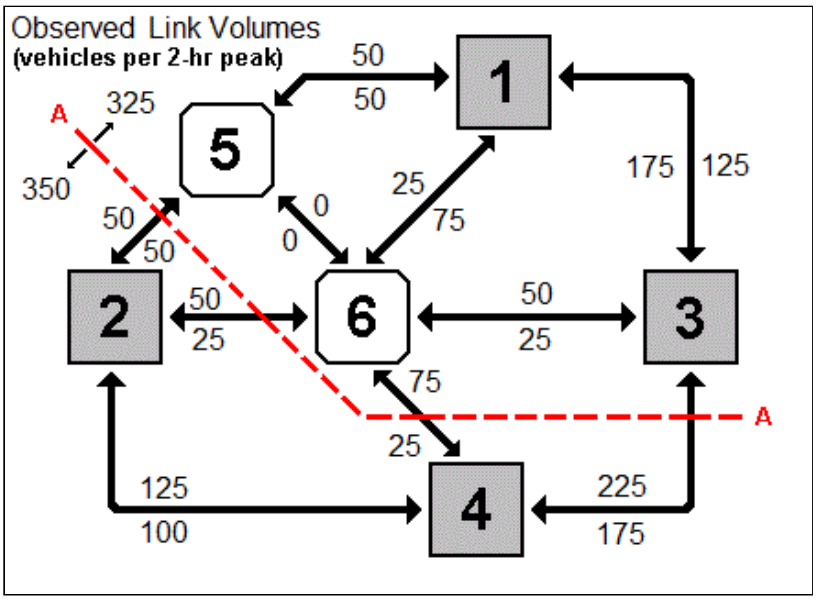
After trip assignment, **re-compute** link travel times using the BPR Link Performance Function. Assume the default values of alpha (0.15) and beta (4.0) and link capacities of 100 vehicles for the combined **2-hour AM-peak period**. **Tabulate** these results (you may append to the table produced for Problem 8). **Explain** how these adjusted link travel times would be used to find the UE solution. The FHWA LPF is:

$t_a = t_a^0 [1 + \text{alpha}(x_a/c_a)^{\text{beta}}]$

where:
t_a = travel time on link a (minutes)
t_a^0 = free flow travel time on link a (minutes)
x_a = volume of link a (vph)
c_a = capacity of link a (100 vehicles per 2-hour peak period)

Problem 10. Trip Assignment: Performance (10 points)

Compare estimated link volumes to observed counts in Figure 10 using a screen line drawn from the upper left to the lower right of the network, crossing links (2-5), (2-6), (4-6), and (4-3). **Tabulate** the volumes by direction crossing the screenline, **compute** percent deviations, and **depict** the results graphically.



Problem 11. Trip Assignment: Performance (10 points)

Summary statistics help describe the overall flow pattern at the end of the full modeling process. Using final link volumes and re-computed travel times for the base network, **compute** the average travel speeds for the 2020 base year. Link results will allow you to compute total vehicle-hours traveled (VHT) and total vehicle-miles traveled (VMT) for total travel in the AM-peak period. Be sure to estimate VHT and VMT for (unassigned) intrazonal trips. **Compare** these results with Problem 4 (in HW 6).

Problem 12. Develop a Network Alternative (5 points)
Given observed 2020 loads on the base network, propose and define an alternative transport system design.

Problem 13. Trip Assignment: User Equilibrium Algorithm (5 points)
Provide the numbered algorithm steps (or flowchart) for the User Equilibrium Algorithm for Trip Assignment.

Last Updated: 26 May 2025