An-Najah National University
Nablus

Faculty of Engineering
Dept of Civil Engineering

TRANSPORTATION PLANNING

HW # 5

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12-21 Determine the minimum path for nodes 1, 3, and 9 in Figure 12.19. Sketch the final trees.

12-22 Assign the vehicle trips shown in the O-D trip table to the network shown in Figure 12.20 using the all-or-nothing assignment technique. Make a list of the links in the network and indicate the volume assigned to each. Calculate the total vehicle minutes of travel. Show the minimum path and assign traffic for each of the five nodes.

	Trips Between Zones				
From/To	*1*	*2*	*3*	*4*	*5*
1	0	100	100	200	150
2	400	0	200	100	500
3	200	100	0	100	150
4	250	150	300	0	400
5	200	100	50	350	0

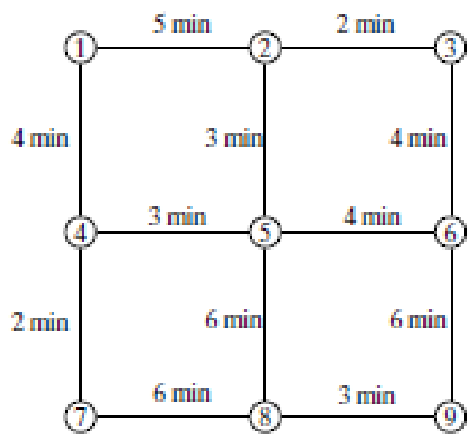

Figure 12.19 Link Node Network

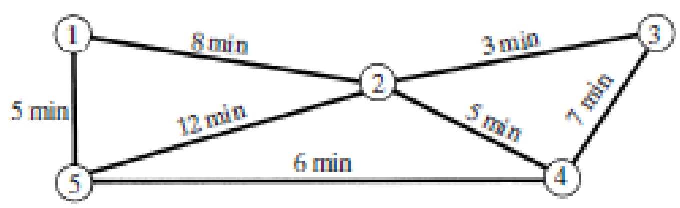

Figure 12.20 Highway Network

12-24 Given the following information, and using the generalized capacity restraint link performance function, perform two iterations of multipath traffic assignment. A flow of 10,500 vehicles in the peak hour is to be distributed between three routes whose properties are given in the following table.

Link Performance Component	*Route 1*	*Route 2*	*Route 3*
Free-flow travel time (min.)	17.0	15.5	12.5
Capacity (veh/h)	3800	4200	6600
α	0.3	0.5	0.6
β	2.5	3.5	4.5

8.22 Three routes connect an origin and a destination with performance functions $t_1 = 8 + 0.5x_1$, $t_2 = 1 + 2x_2$, and $t_3 = 3 + 0.75x_3$, with the x's expressed in thousands of vehicles per hour and the t's expressed in minutes. If the peak-hour traffic demand is 3400 vehicles, determine user equilibrium traffic flows.

8.23 Two routes connect a suburban area and a city, with route travel times (in minutes) given by the expressions $t_1 = 6 + 8(x_1/c_1)$ and $t_2 = 10 + 3(x_2/c_2)$, where the x's are expressed in thousands of vehicles per hour and the c's are the route capacities in thousands of vehicles per hour. Initially, the capacities of routes 1 and 2 are 4000 and 2000 veh/h, respectively. A reconstruction project on route 1 reduces the capacity to 3000 veh/h, but total traffic demand is unaffected. Observational studies note a 35.28-second increase in average travel time on route 1 and a 68.5% increase in flow on route 2 after reconstruction begins. User equilibrium conditions exist before and during reconstruction. If both routes are always used, determine equilibrium flows and travel times before and after reconstruction begins.

8.42 Two routes connect an origin-destination pair, with 2500 and 2000 vehicles traveling on routes 1 and 2 during the peak hour, respectively. The route performance functions are $t_1 = 12 + x_1$ and $t_2 = 7 + 2x_2$, with the x's expressed in thousands of vehicles per hour and the t's in minutes. If vehicles could be assigned to the two routes such as to achieve a system-optimal solution, how many vehicle-hours of travel time could be saved?