MthSc 814 **Assignment #2** Fall 2011

Due 9/27/11

1. Suppose you have $50,000 to invest in 5 possible bond funds with different yields and returns, but with the same maturity. In the interests of diversifying your portfolio, you will select at most one of each bond fund. Suppose also that you want to *fully invest* the $50,000. The table below gives the returns for each bond fund as well as the yields (percentages).

Bond	Denomination	Return	Yield
A	$10,000	$2100	21%
B	$10,000	$1300	13%
C	$20,000	$3200	16%
D	$20,000	$3100	15.5%
E	$30,000	$5100	17%

Formulate this as an optimal path problem in an acyclic network and then *solve* using a suitably modified version of the Reaching Algorithm. To simplify your constructed network, you need not include possibilities that cannot lead to fully using up the $50,000. Be sure to show clearly the evolution of node labels and predecessors during application of the Reaching Algorithm. At the end show the optimal tree as well as the optimal solution to this investment problem.

2. AMO, Problem 4.13. Each duty period is of the form *a*-*b* and this indicates that the duty period begins at the start of hour *a* and ends at the start of hour *b*. Use the table below for duty hours and costs. *Formulate* (but do not solve) as a shortest path problem on an appropriate network. HINT: Let the nodes represent hours.

duty period	9–1	9–11	10–12	12–3	12–5	1–4	2–5	3–5	4–5
cost	30	18	5	18	38	22	20	12	9

3. We want to find a shortest path tree rooted at node 1 in the acyclic network below.

a. Use Dijkstra's Algorithm. Show at each iteration $D(\cdot)$, $pred(\cdot)$, and the selected node i^*, as well as the final shortest path tree. [You can display your results as a table with the above entries for each row/iteration.]

b. Use the Pulling Algorithm. Show at each step the node processed and how its label is computed.