

**ISyE 3103 Introduction to Supply Chain Modeling:
Logistics
Summer 2012
Quiz 2
July 16, 2012**

Instructions

1. There are 2 pages and 10 points.
2. No books, notes, computers, calculators, cell phones, or other electronic equipment allowed.
3. Do your own work.
4. Show all calculations.

Minimum Cost Paths

You work for the Buzz Party presidential candidate's campaign. The campaign team is planning a tour of some cities. It is quite expensive for the candidate's entire entourage to travel. Part of the cost is offset by campaign dinners, with supporters paying phenomenal fees to attend a dinner with the candidate, with an exorbitant extra fee for having your picture taken with the candidate. The expected dinner and photo revenues depend on the cities visited, as given below. You want to find the least net cost paths from Atlanta to each other city, where net cost is the travel cost for the candidate's entourage minus the expected revenue received at the cities visited.

The following table gives the travel costs between city pairs. Note that travel is allowed in either direction with the same travel cost (but not the same revenue).

| Location i | Location j | Travel Cost between i and j |
|--------------------------------|--------------------------------|--|
| Atlanta (A) | Birmingham (B) | 200 |
| Atlanta (A) | Chattanooga (C) | 210 |
| Atlanta (A) | Savannah (S) | 430 |
| Chattanooga (C) | Knoxville (K) | 590 |
| Chattanooga (C) | Nashville (N) | 190 |
| Chattanooga (C) | Memphis (M) | 460 |
| Birmingham (B) | Chattanooga (C) | 230 |
| Birmingham (B) | Memphis (M) | 420 |
| Birmingham (B) | Knoxville (K) | 670 |
| Birmingham (B) | Nashville (N) | 400 |
| Memphis (M) | Nashville (N) | 290 |
| Knoxville (K) | Nashville (N) | 260 |
| Knoxville (K) | Savannah (S) | 390 |

The following table gives the sponsorship revenue if a city is visited (the sponsorship revenue is earned only once if the city is visited).

| Location i | Expected Revenue at i |
|-----------------|-------------------------|
| Birmingham (B) | 230 |
| Chattanooga (C) | 130 |
| Knoxville (K) | 120 |
| Memphis (M) | 220 |
| Nashville (N) | 240 |
| Savannah (S) | 100 |

1. Use an algorithm from class to determine the minimum net cost paths between Atlanta and each other city. Present your work neatly in a table.

Answer: Note that you should not use Dijkstra's algorithm, because some of the links have negative net cost.

| Step | Birmingham | Chattanooga | Knoxville | Memphis | Nashville | Savannah | List |
|------|---------------|---------------|---------------|---------------|---------------|---------------|-------|
| Init | ∞ [-1] | ∞ [-1] | ∞ [-1] | ∞ [-1] | ∞ [-1] | ∞ [-1] | A |
| 1 | -30 [A] | 80 [A] | ∞ [-1] | ∞ [-1] | ∞ [-1] | 330 [A] | BCS |
| 2 | -30 [A] | 70 [B] | 550 [B] | 170 [B] | 130 [B] | 330 [A] | CSKMN |
| 3 | -30 [A] | 70 [B] | 540 [C] | 170 [B] | 20 [C] | 330 [A] | SKMN |
| 4 | -30 [A] | 70 [B] | 160 [N] | 90 [N] | 20 [C] | 330 [A] | SKM |
| 5 | -30 [A] | 70 [B] | 160 [N] | 90 [N] | 20 [C] | 330 [A] | SK |
| 6 | -30 [A] | 70 [B] | 160 [N] | 90 [N] | 20 [C] | 330 [A] | S |
| 7 | -30 [A] | 70 [B] | 160 [N] | 90 [N] | 20 [C] | 330 [A] | |

2. Draw the resulting shortest path tree.

Answer: The following edges are in the shortest path tree from Atlanta: (A,B), (B,C), (C,N), (N,M), (N,K), (A,S).

3. Report the minimum net cost path between Atlanta and Memphis.

Answer: A,B,C,N,M