

MthSc 814 Test #2 – Outline

All-Pairs Shortest Paths

- optimality conditions
- transform to nonnegative lengths
- Floyd-Warshall algorithm

Maximum Flows

- formulation as linear program
- residual network
- minimum capacity cuts
- weak duality result: flow value \leq cut capacity
- flow across a cut
- generic augmenting path algorithm (Ford-Fulkerson)
 - FINDPATH
 - termination, with minimum capacity cut
- max-flow min-cut theorem

Applications

- finding a feasible flow: supply/demand $b(i)$ at nodes
- feasibility theorem
- maximum flows with lower bounds
- network connectivity
- Rook-Plank theorem
- Sudoku puzzles
- matchings: Hall's theorem, node covers
- logical constraints: site selection, open pit mining
- consistent rounding problems

Max Flow Algorithms

- Ford-Fulkerson generic algorithm
- maximum capacity augmentation
- capacity scaling algorithm
- shortest augmenting path algorithm
 - BFS & distance label approaches
- algorithm mechanics
- complexity analysis