Problem 1. Determine unique min-cut.

Solution:
Algorithm Description:

Proof of Correctness:

Complexity Analysis:

Collaborations (if any):
Problem 2. (DPV 7.17)

Solution:

a. Max flow and Min cut:

b. Residual Graph:

c. Bottleneck Edges:

d. Example of network without bottleneck edges:

e. Algorithm Description:
Proof of Correctness:

Complexity Analysis:

Collaborations (if any):
Problem 3: Flow Design Problem

Solution:
Algorithm Description:

Flow Diagram:

Proof of Correctness:

Complexity Analysis:

Collaborations (if any):
Problem 4. (DPV 8.12) NP-Completeness

Solution:

a. Proof:

b. Proof:

Collaborations (if any):
Problem 5. (DPV 9.6) Approximation Algorithm.

Solution:
Proof:

Collaborations (if any):
Problem 6. (DPV 7.3) Linear Programming

Solution:
Variables:

Constraints:

Objective Function:

Collaborations (if any):

Solution:

a. Final Coloring:
   • Strategy A:
   • Strategy B:

b. Total number of nodes explored:
   • Strategy A:
   • Strategy B:

Collaborations (if any):