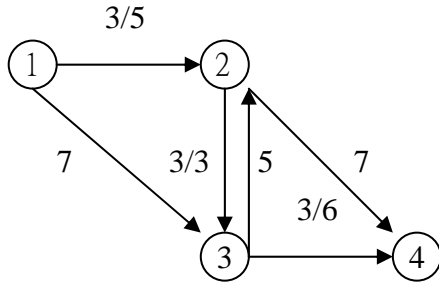
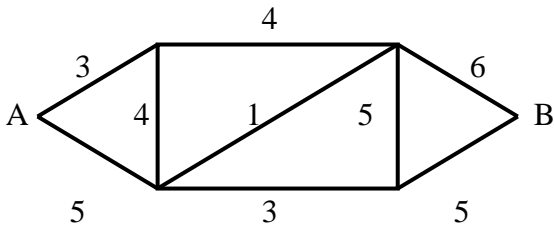


- (a) Step-by-step using Ford-Fulkerson algorithm to find the maximum flow from vertex 1 to 4. (10pt)
 (b) What is the minimum-cut? (5pt)

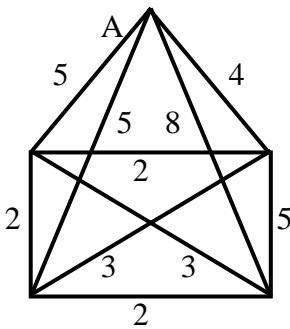


- Prove the following by mathematical induction:
 $1^2 + 3^2 + \dots + (2n + 1)^2 = (n + 1)(2n + 1)(2n + 3)/ 3$, for $n > 0$. (10pt)

- Given the following graph,
 (a) Find the shortest path from vertex A to vertex B. (5pt)
 (b) Find the minimum spanning tree. (5pt)
 (c) Is there Euler path or circuit? (5pt)



- Given the following graph,
 (a) Using NNM to find the shortest Hamiltonian circuit from vertex A. (5pt)
 (b) What is the optimal Hamiltonian circuit? (5pt)



- Determine the number of integer solutions of $x_1 + x_2 + x_3 + x_4 = 35$ where $x_1, x_2, x_3 > 0, 0 < x_4 < 26$. (10pt)
- For primitive statements p and q , simplify the compound statement $[(p \vee q) \wedge (p \vee \neg q)] \vee q$. (10pt)
- How many three-factor unordered factorization, where each factor > 1 , are there for 156009? (10pt)
- Construct a state diagram for a finite state machine with $I = O = \{0, 1\}$ that recognizes all strings in the language $\{0, 1\}^* \{01\} \cup \{0, 1\}^* \{10\}$. (10pt)
- If $A = \{u, v, w, x, y, z\}$, determine the number of relations on A that are
 (a) reflexivity and contain (x, y) ; (5pt)
 (b) symmetric and contain (x, y) . (5pt)