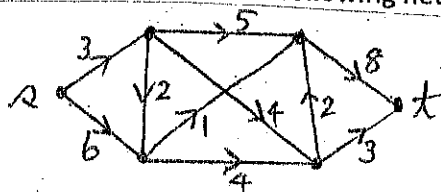


We shall use the following notations for a graph G .

- $\alpha(G)$: Independence number; $\alpha_1(G)$: Edge independence number
- $\sigma(G)$: Vertex cover number; $\sigma_1(G)$: Edge cover number
- $\gamma(G)$: Domination number
- $\chi(G)$: Chromatic number; $\chi'(G)$: Chromatic index

- Give the definitions of the following terms for a given graph G . (3 points each)
 - Chromatic number
 - Edge cover number
 - Dominating set
 - Graceful labeling
 - Vertex-distinguishing labeling
- Answer the following questions (with explanation). (5 points each)
 - What is the vertex cover number and independence number of the Petersen graph?
 - Find $\chi'(K_{17})$.
 - Find a prime sum labeling of C_{28} by using $\{1, 2, \dots, 28\}$.
 - Are K_6 and $K_{3,4}$ planar graphs?
 - Find the maximum flow value of the following network.



- Prove three of the following statements. (10 points each)
 - If G is a connected planar (p, q) -graph drawn on the plane with f regions, then $p - q + f = 2$. (p is the number vertices and q is the number of edges in G .)
 - If G is a graph, then the independence number of G , $\alpha(G) \geq \sum_{v \in V(G)} 1/(\deg_G(v)+1)$.
 - If G is d -degenerate, then $\chi(G) \leq d + 1$.
 - If $G = (A, B)$ is a bipartite graph such that for each $S \subseteq A$, $|N_G(S)| \geq |S|$, then G has a matching saturates A . (Hall's Theorem)
 - If G is a connected graph of order p , then $\alpha_1(G) + \sigma_1(G) = p$.