

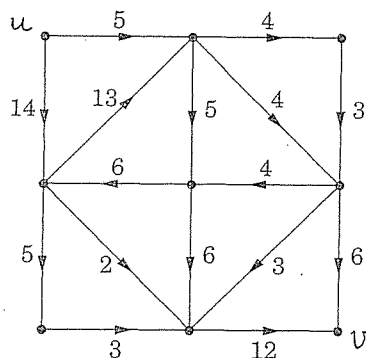
1. Give the definitions of the following terms. (20 points)

- (a) Induced subgraph
- (b) Graph isomorphism
- (c) k-connected graph
- (d) Chromatic number

2. Find a graph G to satisfy the following conditions respectively. (30 points) (Explain your answers.)

- (a) $\delta(G) = 2$, $\text{rad}(G) = 7$ and $\text{diam}(G) = 11$.
- (b) G is 3-regular, 2-connected and G contains no Hamilton cycles.
- (c) $\delta(G) = 10$, $\kappa_1(G) = 8$ and $\kappa(G) = 3$.

3. Find the maximum flow of the following network (with source u and sink v). (15 points, explain your answer)



- 4. Prove that a connected graph G contains an Eulerian circuit if and only if every vertex of G is of even degree. (15 points)
- 5. Let G be a graph of order p. Prove that if any two non-adjacent vertices are of degree sum at least p, then G contains a Hamilton cycle. Give an example to show the above sufficient condition is not a necessary condition. (15 points)
- 6. Prove that in any tournament there exists a directed Hamilton path. (15 points)