
CS1340: DISCRETE STRUCTURES II

PRACTICE QUESTIONS III

- (1) Prove that for a bipartite graph G on n vertices the number of edges in G is at most $\frac{n^2}{4}$.
- (2) A perfect matching on a graph is a matching containing $n/2$ edges, i.e. perfect matchings are possible only with an even number of vertices.
- (3) Every regular bipartite graph has a perfect matching. Prove.
- (4) Every subgraph of a bipartite graph is bipartite.
- (5) Every simple graph $G = (V, E)$ has a bipartite graph with at least $|E|/2$ edges.
- (6) When $G = (V, E)$ is a noncomplete connected graph with at least 3 vertices then vertex connectivity $\kappa(G) \leq \min_{v \in V} \deg(v)$ and edge connectivity $\lambda(G) \leq \min_{v \in V} \deg(v)$.
- (7) The existence of a simple circuit of a particular length is a graph invariant.
- (8) Show that K_n has a Hamilton circuit whenever $n \geq 3$.
- (9) If G is a connected planar simple graph then G has a vertex of degree not exceeding 5.
- (10) A graph with at least 3 vertices is 2-connected iff every pair of vertices lie in a cycle.
- (11) If G_1 and G_2 are two connected subgraphs of G having at least one vertex in common then $G_1 \cup G_2$ is connected.
- (12) The complementary graph \hat{G} of a simple graph G has the same vertices as G . Two vertices are adjacent in \hat{G} if and only if they are not adjacent in G . If a graph G is not connected, prove that its complement graph is connected.
- (13) Show that the property that a graph is bipartite is an isomorphic invariant.

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