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APPENDIX

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Definition 1. A graph G consists of a finite nonempty set $V(G)$ of elements, called vertices, and the set $E(G)$ of 2-elment subsets of $V(G)$, called edges. We call $V(G)$ as the vertex set of G and $E(G)$ as the edge set of G. If $\{x, y\}$ is an edge in a graph G, then an edge $\{x, y\}$ joins x and y, or x and y are adjacent, or an edge $\{x, y\}$ is incident with x(or y). We usually write $\{x, y\}$ as xy.

Definition 2. A *path* of length n in a graph G is a finite sequence of distinct vertices and edges in G of the form $v_{i_0}, e_{i_1}, v_{i_1}, e_{i_2}, ..., e_{i_n}, v_{i_n}$ where $e_{i_1} = v_{i_0}v_{i_1}$, $e_{i_2} = v_{i_1}v_{i_2}, ..., e_{i_n} = v_{i_{n-1}}v_{i_n}$.

Definition 3. A *path* P_n with n vertices, $n \geq 2$, is a graph which the vertex set is $\{v_1, v_2, ..., v_n\}$ and the edge set is $\{v_1v_2, v_2v_3, ..., v_{n-1}v_n\}$.

Definition 4. A *cycle* C_n with n vertices, $n \geq 3$, is a graph which the vertex set is $\{v_1, v_2, ..., v_n\}$ and the edge set is $\{v_1v_2, v_2v_3, ..., v_{n-1}v_n, v_nv_1\}$.

Definition 5. A graph G is *connected* if every pair of vertices is joined by a path and disconnected otherwise.

Definition 6. A *subgraph* of a graph G is a graph H such that $V(H) \subseteq V(G)$ and $E(H) \subseteq E(G)$ and the assignment of endpoints to edges in H is the same as in G.

Definition 7. A *component* of a graph G is a connected subgraph of G that is not contained in any larger connected subgraph of G.

Definition 8. The *degree* of a vertex v in a graph G, denoted by deg v, is the number of edges incident with v.

Definition 9. The *distance* $d(u,v)$ between two points *u* and *v* in G is the length of a shortest path joining them.

Definition 10. The *disjoint union* of graphs $G_1, G_2, ..., G_m$, written $G_1 + G_2 + ... + G_m$, is the graph obtained by taking the union of graphs $G_1, G_2, ..., G_m$ with disjoint vertex sets. If $G_1 = G_2 = ... = G_m = G$, then $G_1 + G_2 + ... + G_m$ is denoted by mG and is called the disjoint union of *m* copies of *G*.

Definition 11. The *join* of graphs *G* and *H*, written $G \vee H$, is the graph obtained from the disjoint union $G + H$ by adding the edges $\{xy : x \in V(G), y \in V(H)\}$.

Definition 12. A *complete graph* K_n is a graph of *n* vertices which any two distinct vertices are adjacent.

Definition 13. The *cartesian product* of graphs *G* and *H*, written $G \times H$, is the graph with vertices set $V(G) \times V(H)$ specified by putting (u,v) adjacent to (u',v') if and only if $u = u'$ and $vv' \in E(H)$, or $v = v'$ and $uu' \in E(G)$.

Definition 14. An *independent set* or *partite set* in a graph is a set of pairwise nonadjacent vertices.

Definition 15. A *complete bipartite graph* $K_{m,n}$ is a graph of $m + n$ vertices which $V(G)$ is the union of two disjoint independent sets and two vertices are adjacent if and only if they are in the different partite sets.

VITA

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