

# Immanants and Extended GTS Operation on Bipartite Graphs

## Abstract

Let  $T$  be a tree on  $n$  vertices with Laplacian matrix  $L_T$ . Let  $\text{GTS}_n$  be the generalized tree shift poset on the set of unlabeled trees with  $n$  vertices. Inequalities are known between coefficients of immanantal polynomials of  $L_T$  as we go up  $\text{GTS}_n$  poset. We extend GTS operation on tree to bipartite graphs we call it EGTS operation. Using vertex orientation, we generalize these known inequalities for trees to bipartite graphs when we use EGTS operation. Moreover we define EGTS poset on  $\Omega_{C_k}^v(n)$ , the set of unlabeled unicyclic graphs with  $n$  vertices where each vertex of the cycle  $C_k$  (with cycle length  $k$ ) has degree 2 except one vertex  $v$ . Thus for all monotonicity results on this EGTS poset we get max-min pair among all unicyclic graphs in  $\Omega_{C_k}^v(n)$ .