$V_1 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ prop to any perm inv.
matrix

$g = G - G_\neg$, G digraph upper triangle

$G_\neg$ complement digraph upper triangle

Invariant matrix M_{ij}

$(g^i V_1) \cdot (g^j V_1)$

Take a graph with relabeled vertices. The action of g^i on a vector is now

$P^T(g^i(PV_1))$ or one at the $P^T g P(P^T g P(\ldots V_1$

The inner product for same graph acting with relabeled vertices

$(P^T g^i P V_1)^T (P^T g^j P V_1)$

$V_1^T (P^T g^i P)^T P^T g^j P V_1$

$V_1^T (g^i P)^T P P^T g^j P V_1$

$V_1^T P^T g^{iT} P P^T g^j P V_1$

$V_1^T g^{iT} g^j V_1$

$(g^i V_1)^T g^j V_1$