

INVARIANTS OF COMPOSITE NETWORKS  
ARISING AS A TENSOR PRODUCT

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**Abstract**

We show how the results of Brylawski and Oxley [4] on the Tutte polynomial of a tensor product of graphs may be generalized to colored graphs and the Tutte polynomials introduced by Bollobás and Riordan [1]. This is a generalization of our earlier work on signed graphs with applications to knot theory. Our result makes the calculation of certain invariants of many composite networks easier, provided that the invariants are obtained from the colored Tutte polynomials via substitution and the composite networks are represented as tensor products of colored graphs. In particular, our method can be used to calculate (with relative ease) the expected number of connected components after an accident hits a composite network in which some major links are identical subnetworks in themselves.

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