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Reliability polynomials and their asymptotic limits for families of graphs. (English)

Zbl 1118.82301

J. Stat. Phys. 112, No. 5-6, 1019-1077 (2003).

Summary: We present exact calculations of reliability polynomials $R(G, p)$ for lattice strips G of fixed widths $L_y \leq 4$ and arbitrarily great length L_x with various boundary conditions. We introduce the notion of a reliability per vertex,

$$r(\{G\}, p) = \lim_{|V| \rightarrow \infty} R(G, p)^{1/|V|},$$

where $|V|$ denotes the number of vertices in G and $\{G\}$ denotes the formal limit $\lim_{|V| \rightarrow \infty} G$. We calculate this exactly for various families of graphs. We also study the zeros of $R(G, p)$ in the complex p plane and determine exactly the asymptotic accumulation set of these zeros \mathcal{B} , across which $r(\{G\})$ is nonanalytic.

MSC:

- 82B20 Lattice systems (Ising, dimer, Potts, etc.) and systems on graphs arising in equilibrium statistical mechanics
- 05B35 Combinatorial aspects of matroids and geometric lattices
- 05C35 Extremal problems in graph theory

Cited in 5 Documents

Keywords:

Reliability polynomial; Potts model; Tutte polynomial

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