

Abstract Submitted
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Form of the exact partition function for the generalized Ising model T.R.S. PRASANNA, Dept. of Met. Engg. and Matls. Sci, IIT Bombay — The problem of N interacting spins on a lattice is equivalent to one of N identical clusters linked in a specific manner. The energy of any configuration can be expressed in terms of the energy levels of this cluster. A new expression is obtained for the probability of occurrence of any configuration. A closed form expression is obtained for the exact partition function per spin in terms of the energy levels of this cluster and the degeneracies are functions of temperature. This form represents an alternate and equivalent (sum over energy levels) framework to determine the partition function. The partition functions of all Ising-like models have a common form. This raises a new possibility that the partition function may be determined as a sum of finite number of terms, which may not sum to a single term expression. Seven functions need to be determined to describe the exact partition function of the 3D Ising model. The key to understanding phase transitions and critical phenomena lies in the temperature dependence of degeneracies. It is necessary to develop new techniques to determine the partition function that account for this temperature dependence.

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