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Phase transitions in the van Hemmen model with random crystalline anisotropy field[1] ALBERTO S. DE ARRUDA, DENES M. DE MORAIS, Instituto de Fisica - Universidade Federal de Mato Grosso, JONATHAS N. DA SILVA, JOSÉ R. DE SOUSA, Departamento de Fisica - Universidade Federal do Amazonas, INSTITUTO DE FISICA - UNIVERSIDADE FEDERAL DE MATO GROSSO TEAM, DEPARTAMENTO DE FISICA - UNIVERSIDADE FEDERAL DO AMAZONAS COLLABORATION — In this study we present generalized phase diagrams of van Hemmen model with $S = 1$ and $S = 3/2$ spins plus an anisotropic random crystalline field term. All calculations performed to evaluate the complete phase diagram were performed using a simple cubic lattice, employing the mean field theory in the Curie-Weiss form. This approach, instead of using the standard truncation of the partition function it simply rewrites the Hamiltonian in such a way that allows an exact calculation of the free energy. In spite of being semi-realistic, mean field solutions can give a first qualitative understanding of the thermodynamical behavior of the system. In our work, the effects of randomness of the exchange interaction and the anisotropy of the crystal field were taken into account by using bimodal distributions. In the particular case of $p = 1$ ($D = 0$) we reproduce the original results obtained by van Hemmen, and in the $p = 0$ ($D \neq 0$) case. Our numerical analysis provides second order phase transition lines, including ferromagnetic-to-paramagnetic phase transition in the temperature versus exchange interaction. In summary, our results display tricritical behaviour with second order lines separated by first order lines by tricritical points.

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