The Spin-1 Ising Model on a Two-layer Bethe Lattice with FM/AFM Interactions

Erhan Albayrak, Şeyma Akkaya, Tunç Cengiz

Erciyes University, 38039 Kayseri

Two-layer Bethe lattice with the Ising spins of the top layer having only ferromagnetic (FM) interactions and the bottom layer having only antiferromagnetic (AFM) interactions are allowed to interact with the interlayer interaction either FM or AFM type. The model is studied by using the exact recursion relations in a pairwise approach for given coordination numbers \( q = 3, 4 \) and \( 6 \) with equal external magnetic fields acting on the layers. The phase diagrams of the model are obtained on different planes for given system parameters by studying the ground state (GS) phase diagrams and the thermal variations of the order parameters and the response functions, i.e. the susceptibility and the specific heat, in detail. The model presents second- and first-order phase transitions, and where their lines are combined is the tricritical point. The critical end points are also exist. The reentrant behavior is also seen when the model presents two Neel temperatures.