

# Contents

<b>1</b>	<b>INTRODUCTION</b>	<b>4</b>
1.1	The Potts Model . . . . .	5
1.2	Related Models . . . . .	6
1.2.1	Bond percolation and similar problems . . . . .	6
1.2.2	Resistor network . . . . .	8
1.2.3	Directed bond percolation . . . . .	9
1.2.4	Z(q) model . . . . .	10
1.2.5	Random models . . . . .	13
<b>2</b>	<b>SOME EXACT OR ACCURATE RESULTS</b>	<b>15</b>
2.1	The Pure Potts Model . . . . .	16
2.1.1	d=1 . . . . .	16
2.1.2	d → 1 . . . . .	16
2.1.3	d=2 . . . . .	16
2.1.4	d=3 . . . . .	18
2.1.5	d ≥ 4 . . . . .	18
2.1.6	Bethe lattice . . . . .	19
2.2	The Bond-Random Potts Ferromagnet . . . . .	20
2.2.1	d=2 . . . . .	20
2.2.2	Bethe lattice . . . . .	21
2.3	Resistor Network . . . . .	21
2.3.1	d=2 . . . . .	22
2.3.2	d ≥ 3 . . . . .	22
2.4	Z(q) Model . . . . .	22
2.4.1	Isotropic Z(4) ferromagnet on the square lattice . . . . .	23
2.4.2	Duality . . . . .	23
<b>3</b>	<b>TRANSMISSIVITIES AND THE BREAK-COLLAPSE METHOD</b>	<b>25</b>
3.1	Bond Percolation . . . . .	25

3.1.1	<b>Break-collapse method and other properties</b>	21
3.1.2	<b>Extension to multi-rooted graphs</b>	31
3.2	<b>Potts Model</b>	31
3.2.1	<b>Thermal transmissivity</b>	31
3.2.2	<b>Break-collapse method and other properties</b>	36
3.2.3	<b>Extension to multi-rooted graphs</b>	44
3.2.4	<b>Bond-random model</b>	41
3.3	<b>Related Models</b>	51
3.3.1	<b>Resistor network</b>	51
3.3.2	<b>Directed bond percolation</b>	51
3.3.3	<b>Models with frustration</b>	51
3.3.4	<b>Z(q) model</b>	60
3.3.5	<b>The Discrete Cubic Model</b>	69
4	<b>REAL-SPACE RENORMALIZATION-GROUP APPROACHES</b>	71
4.1	<b>Phase diagram and critical exponents</b>	71
4.1.1	<b>Correlation function preserving RG</b>	71
4.1.2	<b>Other real space RG approaches</b>	91
4.1.3	<b>Connection between the correlation function preserving RG and the phenomenological one</b>	91
4.2	<b>Equation of states and other thermodynamical quantities</b>	91
4.2.1	<b>Free energy, internal energy and specific heat</b>	101
4.2.2	<b>Equations of states</b>	101
4.2.3	<b>Surface tension</b>	101
4.2.4	<b>Correlation length</b>	101
4.3	<b>Interface effects</b>	101
5	<b>FINAL REMARKS</b>	101
	<b>APPENDIX</b>	111
	<b>REFERENCES</b>	131