HOMEWORK ASSIGNMENT #2

DUE: Monday, February 9, 2015
CSCI573: Probabilistic Reasoning, Prof. Nevatia
Spring Semester, 2015

This is the complete assignment; two new problems have been added compared to 2(a). Preferred submission format is in hard copy form in class. However, DEN students, and others who are unable to attend the class in person, may submit electronically in the "Dropbox" on the course page.

1. Exercise 3.5 from the KF book; do parts b, d, f and h only.

2. Consider the "Alarm" network given in slide 12 of Lecture 3 notes. Derive a minimal I-map for this network if we chose the ordering to be J, A, B, M and E. Follow a procedure similar to that shown in Example 3.5 in the book.

3. Do Exercise 4.10 from the KF book.

4. (Exercise 4.13 in the book) Show that we can represent any Gibbs distribution as a log-linear model, as defined in definition 4.15.

5. This question is a simplified version of Exercise 5.13 in the KF book. It starts with a simplified BN2O model as in Fig. 5.1.C; for simplicity, we consider a case with only two parent and two child nodes as shown below. Now suppose that we have the observation that $F_1 = 0$ but results of F_2 are still pending. We can encode this situation in a modified BN2O network B' that has the same structure as B, except that F_1 is omitted from the network. Show that the posterior distribution $\mathrm{p}(D_1, D_2 | F_2, F_1 = 0)$ can be encoded using B' and specify the parameters of B' in terms of the parameters of B.
Hint: you can make use of proposition 5.3 from textbook without proof. For re-parameterization of B', consider changing the prior distributions of disease nodes, or the λ values on the links, or both. Also, note that you are not being asked to generalize for

the situation of n diseases and m findings.