T-79.5102 **Autumn 2008**
Special Course in Computational Logic
Tutorial 3

1. In your local nuclear power station, there is an alarm that senses when a temperature gauge exceeds a given threshold. The gauge measures the temperature of the core. Consider the Boolean variables A (alarm sounds), F_A (alarm is faulty), F_G (gauge is faulty) and the multivalued nodes G (gauge reading) and T (actual core temperature).

(a) Draw a Bayesian network for this domain, given that the gauge is more likely to fail when the core temperature gets too high.

(b) A *polytree* is a singly connected graph: there is at most one undirected path between any two nodes. Is your network a polytree?

(c) Suppose that there are just two possible actual and measured temperatures, normal and high: the probability that the gauge gives the correct temperature is x when it is working, but y when it is faulty. Give the conditional probability table associated with G.

(d) Suppose the alarm works correctly unless it is faulty, in which case it never sounds. Give the conditional table associated with A.

(e) Suppose that the alarm and gauge are working and the alarm sounds. Calculate an expression for the probability that the core temperature is too high, in terms of the various conditional probabilities in the network.

(R&N, Exercise 14.2)