ACS Theory Assignment 2

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1 Question 1: Reliability

1.1 1

A daisy-chain network has a graph consisting of links:

$$l = n - 1 \tag{1}$$

The probability of a failure is p, the probability that there is no error is therefore $1 - p$. So all connecting also means no link failure and since we assume that a link failure is independent. we then get:

$$(1 - p)^{n-1} \tag{2}$$

1.2 2

In the fully connected network there are 3 links that can fail and as long as 2 links are still fully functioning then also all the building are still connected. That 1 link fails we have the probability $p(1 - p)^2$ and when 0 links fail: $(1 - p)^3$. So we get that a fully-connected network is working is then:

$$3p(1 - p)^2 + (1 - p)^3 \tag{3}$$

1.3 3

For above we have now the 2 probabilities from which we can calculate which is the more reliable solution:

For Daisy Chain we get: $p_d = (1 - 0.000001)^{3-1} \approx 0.999998$

For fully connected we get: $p_f = 3 * 0.0001(1 - 0.0001)^2 + (1 - 0.0001)^3 \approx 0.99999997$

So we get that a fully connected with the less reliable links would offer a better solution for the town