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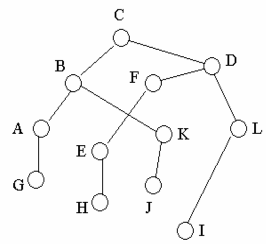
CES 440
8 Dec 2004

Homework #10

16.



22\. A.

E(hops per tran) = $\mathbf{p + 2p(1 - p) + 3(1 - p)^2}$

22\. B.

E(trans per pk) = P(1) + 2*P(2) + 3*P(3) + ...

$= (1 - p)^2 + 2p(2 - p)(1 - p)^2 + 3p^2(2 - p)^2(1 - p)^2 + \ldots$

$= (1 - p)^2 (1 + 2p(2 - p) + 3p^2(2 - p)^2 + \ldots)$

$= (1 - p)^2 \Sigma(n p^{n-1} (2 - p)^{n+1})$

$\mathbf{= ((1 - p)^2 / (p / (2 - p)) \Sigma(n p^n (2 - p)^n}$

22\. C.

When n < 3, P(n) = 0.

When n = 3, P(n) = (1 - p)^2.

When n > 3, Let P(n) be the probability of (n - 3) unsuccessful hops, followed by success.

Let k be an even number. Then

P(k unsuccessful hops) = P(k discards by first router)
+ P((k - 2) "firsts" and 1 "second" discard)
+ P((k - 4) firsts and 2 seconds) + ... + P(n/2 "second" discards)

P(k unsuccessful hops) = p^k + p^(k - 1)*(1 - p) + p^(k - 2)*(1 - p)^2 + ... + p^(k/2)*(1 - p)^(k/2)

Then, with k even,

P(n hops) = (1 - p)^2 * [p^k + p^(k - 1)*(1 - p) + p^(k - 2)*(1 - p)^2 + ... + p^(k/2)*(1 - p)^(k/2)]

= p^k*(1 - p)^2 + p^(k - 1)*(1 - p)^3 + p^(k - 2)*(1 - p)^4 + ... + p^(k/2)*(1 - p)^((k + 4)/2)

... where k = (n - 3).

Let k be an odd number. Then

P(k unsuccessful hops) = P(k discards by first router)
+ P((k - 2) "firsts" and 1 "second" discard)
+ P((k - 4) firsts and 2 seconds) + ... + P(1 "first" and (k-1)/2 "second" discards)

P(k unsuccessful hops) = p^k + p^(k - 1)*(1 - p) + p^(k - 2)*(1 - p)^2 + ...

... + p^((k+1)/2)*(1 - p)^((k-1)/2)

Then, with k odd,

P(n hops) = (1 - p)^2 * [p^k + p^(k - 1)*(1 - p) + p^(k - 2)*(1 - p)^2 + ...

... + p^((k+1)/2)*(1 - p)^((k-1)/2)]

... where k = (n - 3).

Note that k even and k odd, the expressions differ only in the last term.
On the average (half even & half odd),

P(n hops) = (1 - p)^2 * { p^k + p^(k - 1)*(1 - p) + p^(k - 2)*(1 - p)^2 + ...

... + (1/2)*[1 + sqrt(p/(1-p))]*[p*(1-p)]^(k/2) }

... where k = (n - 3).

So the expected value of number of hops is:

E = **(1 - p)^2 * { 3**

+ sum(k from 1 to infinity):[(k + 3)*(p^k + p^(k - 1)*(1 - p)

+ p^(k - 2)*(1 - p)^2 + ...

... + (1/2)*[1 + sqrt(p/(1-p))]*[p*(1-p)]^(k/2))]

(continued on next page ...)

34.

Total Length

	A to R1	R1 to R2	R1 to R2	R2 to B	R2 to B
Total Length	940	500	460	500	460
Identification	1	1	1	1	1
DF	0	0	0	0	0
MF	0	1	0	1	0
Fragment Offset	0	0	60	0	60

37.

2^{18} = **262,144**

38.

c22f1582 = [12*16 + 2].[2*16 + 15].[16 + 5].[8*16 + 2]

= **194.47.21.130**

39.

[ff].[ff].[192 + 32 + 16].0 = [ff].[ff].[11110000].0

= [ff].[ff].[f0].00 -> [10].[00] -> 163 -> 4096 – 2 = **4094**