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CSE 3300

Homework 4

1) Here is the distance entry table from node x:

From/Cost	Node u	Node v	Node x	Node y	Node z
Node v	1	0	3	3	5
Node y	2	3	3	0	5
Node z	7	5	2	5	0
Node x	4	3	0	3	2

Here is the distance entry table from node z:

From/Cost	Node u	Node v	Node x	Node y	Node z
Node v	1	0	3	3	5
Node x	4	3	0	3	2
Node z	6	5	2	5	0

2a) eBGP runs for routers that have different types of intra-AS routing protocols. Since networks AS3 and AS4 have different intra-AS routing protocols and 3c is connected to 4c, 3c learns about x from eBGP routing protocol.

b) iBGP runs for routers that have the same types of intra-AS routing protocols. Since 3a must go through 3c to learn about x, it must learn about x from iBGP routing protocol.

c) eBGP runs for routers that have different types of intra-AS routing protocols. Since networks AS3 and AS1 have different intra-AS routing protocols and 1c is connected to 3a to get to x, 1c learns about x from eBGP routing protocol.

d) iBGP runs for routers that have the same types of intra-AS routing protocols. Since 1d must go through 1a to learn about x, it must learn about x from iBGP routing protocol.

3a) *I* will be equal to *I*1 because the least cost path to 1c in order to learn about x is through 1a, not 1b, since it needs to get to router 1c.

b) Here *I*1 and *I*2 will have the same path cost to get to x, but the path from 1d-1b is closer to the next router over that leads into AS2, so *I* will be set to *I*2.

c) Here *I* will be set to *I*1 because it only must go through AS3 and AS4 to learn about x, whereas it would have to go through AS2, AS5, and AS4 to learn about x if it was set to *I*2.

4) R is equal to the remainder of $D*2^r/G$. We know D and G. r is equal to 4, since 0000 must be appended to D in order to do this problem. Now, divide 10101010100000/10011 = 1011011100. We aren't interested in this though, we want the remainder of the problem. The remainder was 100. So, R = 100.

5a) In order for A to succeed in getting to slot 5, all other nodes must not transmit to 5. This is also the same probability as A not transmitting to 5 but every other node does, which can be written as $p(1-p)^3$, where 3 is the other nodes. Since this is slot 5 though, we need to also look at the probability of A transmitting to 5. This can be written as $(1-p(1-p)^3)^4$. Putting these two probabilities together, we get the probability that node A transmits to 5 first, $(1-p(1-p)^3)^4p(1-p)^3$.

b) We already know the probability for each individual node succeeding in transmitting to slot 4, $p(1-p)^3$. Now, we need to know the probability that any of these can succeed in getting to slot 4. This is simply each nodes' probability when going to slot 4 which is written as, $4\ p(1-p)^3$.

c) We now know the probability that any node succeeds in some slot, $4\ p(1-p)^3$. Now, we need to find out the probability that no nodes succeed in transmitting to the first 2 slots before successfully transmitting to the 3rd slot. For no node to get to a slot, $1-4\ p(1-p)^3$ is the probability. So, all we need to do is account for this for only the first two slots and combine it with our previous probability, $(1-4p(1-p)^3)^2 4p(1-p)^3$.

d) The efficiency is any slot successfully getting some transmission from any node. We already found this probability earlier, $4p(1-p)^3$.

6) For K = 100, we know that R = 10 Mbps. So, to calculate waiting time, we use:

Waiting time = K * 512 bits / (10 * 10^6) bits per second

Waiting time = (100 * 512) / (10 * 10^6) bits per second

Waiting time = 0.00512 seconds or 5.12 milliseconds.

For K = 100 and R = 100 Mbps, we do the same:

Waiting time = K * 512 bits / (100 * 10^6) bits per second

Waiting time = (100 * 512) / (100 * 10^6) bits per second

Waiting time = 0.000512 seconds or 0.512 milliseconds.