**EECS 3214 Assignment 4**

1. a) D is multiplied by 25 (# of G bits – 1) to get 11100011**00000**. Next this number is divided by G = 110011.

**10110110**

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**110011** ) **1110001100000**

110011

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010111100000

110011

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1110000000

110011

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010110000

110011

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1111100

110011

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**11010**

Therefore, the value of R is 11010.

b) The frame transmitted is determined by adding the remainder to 25 \* D.

1110001100000 + 11010 = **1110001111010**

Therefore, the frame transmitted is 1110001111010.

c) The received frame is divided by G. If there is no remainder then the receiver received the correct frame. In this case, the remainder is 0 so there are no errors.

1. a) D is multiplied by 24 (# of G bits – 1) to get 11100110**0000.** Next this number is divided by G = 11001.

**10110110**

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**11001** ) **111001100000**

11001

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01011100000

11001

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111000000

11001

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01010000

11001

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110100

11001

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**110**

Therefore, the value of R is 110.

b) The frame transmitted is determined by adding the remainder to 24 \* D.

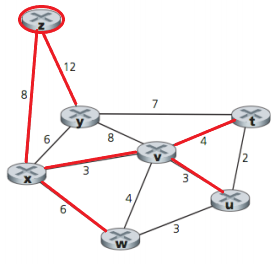
111001100000 + 110 = **111001100110**

Therefore, the frame transmitted is 111001100110.

c) The received frame is divided by G. If there is no remainder then the receiver received the correct frame. In this case, the remainder is 0 so there are no errors.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Step** | **N’** | **D(t),p(t)** | **D(u),p(u)** | **D(v),p(v)** | **D(w),p(w)** | **D(x),p(x)** | **D(y),p(y)** |
| **0** | z | Inf | Inf | Inf | Inf | 8, z | 12, z |
| **1** | zx | Inf | Inf | 11, x | 14, x | 8, z | 12, z |
| **2** | zxv | 15, v | 14, v | 11, x | 14, x | 8, z | 12, z |
| **3** | zxvu | 15, v | 14, v | 11, x | 14, x |  |  |
| **4** | zxvuy | 15, v | 14, v |  |  |  |  |
| **5** | zxvuyw |  |  |  |  |  |  |
| **6** | zxvuywt |  |  |  |  |  |  |

Note: When values start repeating, that is the best value.



1. Node Z table

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | Cost to | | |  |  |  |  | Cost to | | |  |  |  |  | Cost to | | |  |
|  |  | u | v | x | y | z |  |  | u | v | x | y | z |  |  | u | v | x | y | z |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | v | Inf | Inf | Inf | Inf | Inf |  | v | 1 | 0 | 3 | Inf | 6 |  | v | 1 | 0 | 3 | 3 | 5 |
| From | x | Inf | Inf | Inf | Inf | Inf | From | x | x | Inf | 3 | 0 | 3 | From | x | 4 | 3 | 0 | 3 | 2 |
|  | y | Inf | 6 | 2 | Inf | 0 |  | y | 7 | 5 | 2 | 5 | 0 |  | y | 6 | 5 | 2 | 5 | 0 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | Cost to | | |  |
|  |  | u | v | x | y | z |
|  |  |  |  |  |  |  |
|  | v | 1 | 0 | 3 | 3 | 5 |
| From | x | 4 | 3 | 0 | 3 | 2 |
|  | y | 6 | 5 | 2 | 5 | 0 |

1. a) Router 3c learns about prefix x from **eBGP**.

b) Router 3a learns about x from **iBGP**.

c) Router 1c learns about x from **eBGP**.

d) Router 1d learns about x from **iBGP**.

1. Slotted ALOHA (E = Np(1-p)^(N-1)) vs Pure ALOHA (E = Np(1-p)^2(N-1))

|  |  |  |  |
| --- | --- | --- | --- |
| probability | EFFICIENCY |  |  |
|  | n = 15 | n = 25 | n = 35 |
| 0 | 0 | 0 | 0 |
| 0.1 | 0.343151887 | 0.199416 | 0.097344936 |
| 0.2 | 0.131941395 | 0.023612 | 0.003549422 |
| 0.3 | 0.030520038 | 0.001437 | 5.68228E-05 |
| 0.4 | 0.00470185 | 4.74E-05 | 4.01117E-07 |
| 0.5 | 0.000457764 | 7.45E-07 | 1.01863E-09 |

|  |  |  |  |
| --- | --- | --- | --- |
| probability | EFFICIENCY |  |  |
|  | n = 15 | n = 25 | n = 35 |
| 0 | 0 | 0 | 0 |
| 0.1 | 0.078502145 | 0.015906714 | 0.002707439 |
| 0.2 | 0.005802844 | 0.000111504 | 1.79977E-06 |
| 0.3 | 0.000206994 | 2.75275E-07 | 3.07508E-10 |
| 0.4 | 3.68457E-06 | 2.24523E-10 | 1.14925E-14 |
| 0.5 | 2.79397E-08 | 4.44089E-14 | 5.92923E-20 |

NOTE: These graphs and calculations were made in excel and imported here.

1. The adapter waits 51200 bit times (k \* 512 bit times, where k = 100) after a collision.

For a 10 Mbps broadcast channel, this wait is 5.12 ms (bit times / bps).

For a 100 Mbps broadcast channel, this wait is 0.512 ms (bit times / bps).

1. i) **Action:** B sends a frame to E

**State:** Switch learns interface corresponding to MAC address of B

**Link forwarded to:** A, C, D, E, F

**Explanation:** Switch does not know the interface corresponding to MAC address of E, because switch table is empty

ii) **Action:** E replies with a frame to B

**State:** Switch learns interface corresponding to MAC address of E

**Link forwarded to:** B

**Explanation:** Switch knows interface corresponding to MAC address of B

iii) **Action:** A sends a frame to B

**State:** Switch learns the interface corresponding to MAC address of A

**Link forwarded to:** B

**Explanation:** Switch already knows the interface corresponding to MAC address of B

iv) **Action:** B replies with a frame to A

**State:** Switch table state remains the same

**Link forwarded to:** A

**Explanation:** Switch already knows the interface corresponding to MAC address of A