CPTR 328 Chapter 5 Problems

Problems: 2, 5, 6, 8, 9, 14, 17, 29, 35, WS (first only)

1. Show (give an example other than the one in Figure 5.6) that two-dimensional parity checks can correct and detect a single bit error. Show a double-bit error (by giving an example) that can be detected, but not corrected.

Single corrected error

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Double bit uncorrectable error

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

1. Consider the 7-bit generator, G=10011, and suppose that D had the value 1010101010. What is the value of R? (Show your work)

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |

1. Consider the previous problem, but suppose that D has the following values (show your work)
	1. 1001000101

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |

* 1. 1010001111

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |

* 1. 0101010101

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |

1. In Section 5.3, we provided an outline of the derivation of the efficiency of slotted ALOHA. In this problem we’ll complete the derivation.
	1. Recall that when there are $N$ active nodes, the efficiency of slotted ALOHA is $Np\left(1-p\right)^{N-1}$. Find the value of $p$ that maximizes this expression (Find someone who has take calculus).
	2. Using the value of $p$ found in (a), find the efficiency of slotted ALOHA by letting $N$ approach infinity. Hint:

$$\lim\_{N\to \infty }\left(1-\frac{1}{N}\right)^{N}=\frac{1}{e}$$

1. Show that the maximum efficiency of pure ALOHA is $1/2e$. Note: This problem is easy if you have completed (8).
2. Consider three LANs interconnected by two routers, as shown in Figure 5.38. ***FOR (a) and (b) create a graphic containing the information requested***
	1. Assign IP addresses to all the interfaces. For Subnet 1 use addresses of the form 192.168.1.xxx; for subnet 2 use addresses of the form 192.168.2.xxx; and for subnet 3 use addresses of the form 192.168.3.xxx.
	2. Assign MAC addresses to all of the adapters.

[insert graphic for (a) and (b)

* 1. Consider sending an IP datagram from Host E to Host F. Suppose all of the ARP tables are up to date. Enumerate *ALL* the steps, as done for the single-router example in Section 5.4.2.
	2. Repeat (c), now assuming that the ARP table in the sending host is empty (and the other tables are up to date).
1. Recall that with the CSMA/CD protocol, the adapter waits $K ⋅512$ bit times after a collision, where $K$ is drawn randomly.
	1. For$ K=100$, how long does the adapter wait until returning to step $2$ for a $10$ Mbps Ethernet?
	2. For$ K=100$, how long does the adapter wait until returning to step $2$ for a $10$0 Mbps Ethernet?
2. Consider Figure 5.26. Suppose that all links are 100 Mbps. What is the maximum total *aggregate* throughput that can be achieved among the 9 hosts and 2 servers in this network? You can assume that any host or server can send to any other host or server. Why (as in explain why you got the value you did)?
3. Consider the MPLS network shown in Figure 5.36, and suppose that routers R5 and R6 are now MPLS enabled. Suppose that we want to perform traffic engineering so that packets from R6 destined for A are switched to A via R6-R4-R3-R1. And packets from R5 destined for A are switched via R5-R4-R2-R1. Show the MPLS tables in R5 and R6, as well as the modified table in R4, that would make this possible.

R4

|  |  |  |  |
| --- | --- | --- | --- |
| Inlabel | Outlabel | Dest. | Outinterface |
|  |  |  |  |

R5

|  |  |  |  |
| --- | --- | --- | --- |
| Inlabel | Outlabel | Dest. | Outinterface |
|  |  |  |  |

R6

|  |  |  |  |
| --- | --- | --- | --- |
| Inlabel | Outlabel | Dest. | Outinterface |
|  |  |  |  |