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CNT 5505

Assignment 1

1. An advantage to layering is that it is broken up into pieces that are easy to maintain and update because they are small in scope. The disadvantage to layering is that it is not always clear which layer should implement which functionality and there can be different ways to handle errors on each layer. The application layer is the top level and every other level is used to support this layer. Presentation layer is used for data conversion to how it is presented, an example would be converting little endian or big endian. The session layer is responsible for authenticating a session and also handles recovery if a session is broken for any reason. The transport layer is used for TCP and UDP. Network layer determines how to route packets and the naming and addressing of packets. The data link layer is to explain how to transport data between nodes. The physical layer handles the raw bits transferred over a wire.

2. Circuit switching uses all resources needed for a connection. Packet switching shares the network with others and divides each chunk of data into packets. The disadvantage to circuit switching is that once the cap to bandwidth is met there can be no more connections over that line. The advantage is that once a connection is setup it will continue and not have any disruptions. The advantage to packet switching is that there can be more people on a network at once which will raise the number of people that can be served. The disadvantage is that because it is on a first come first serve basis there can be delays in the service for every packet of data.

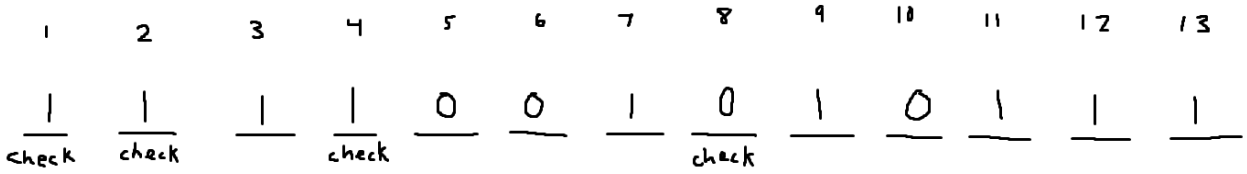
3. Time division frequency divides the amount of time allotted for each connection

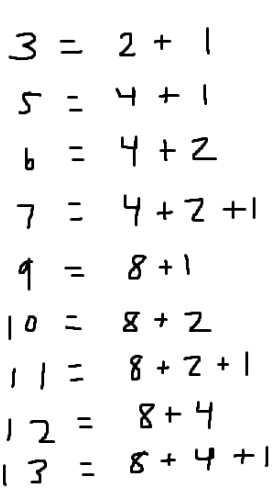
to send packets. So if there are 3 connections it will have each connection will have a time slot of c1, c2, c3 and then it will repeat this pattern. Frequency division uses different frequencies for each connection. This allows all connections to send data at the same time on their own frequency. Code division allows all connections to use the entire frequency band and it uses codes of -1 and +1 in order to send data. This allows them to use their code in order to find out if a 0 was transmitted with the total being negative or a 1 being transmitted if the total is positive.

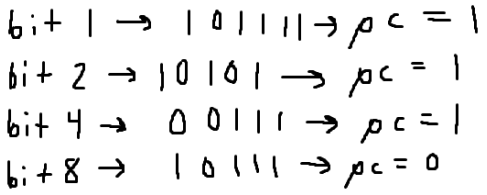
4. With a signal to noise ratio of 20db that means that S/N = 100 So to get the maximum data rate we do 4KHzlog2(1+100) = 26.6 Kbps.

5. 1 check bit is needed in order to detect a single bit error because you can do an even or odd parity check and if it does not match that means there is an error. To correct a single bit error on a message length of 9 we would need to find an r such that (9 + r + 1) <= 2^r. 4 satisfies this requirement so you would need 4 check bits to fix a 1 bit error. For the message 100110111 in order to just check if there is a single bit error we would need to send 1001101110. There is a last 0 added to the message because there are an

even number of 1's in the message. For error correction

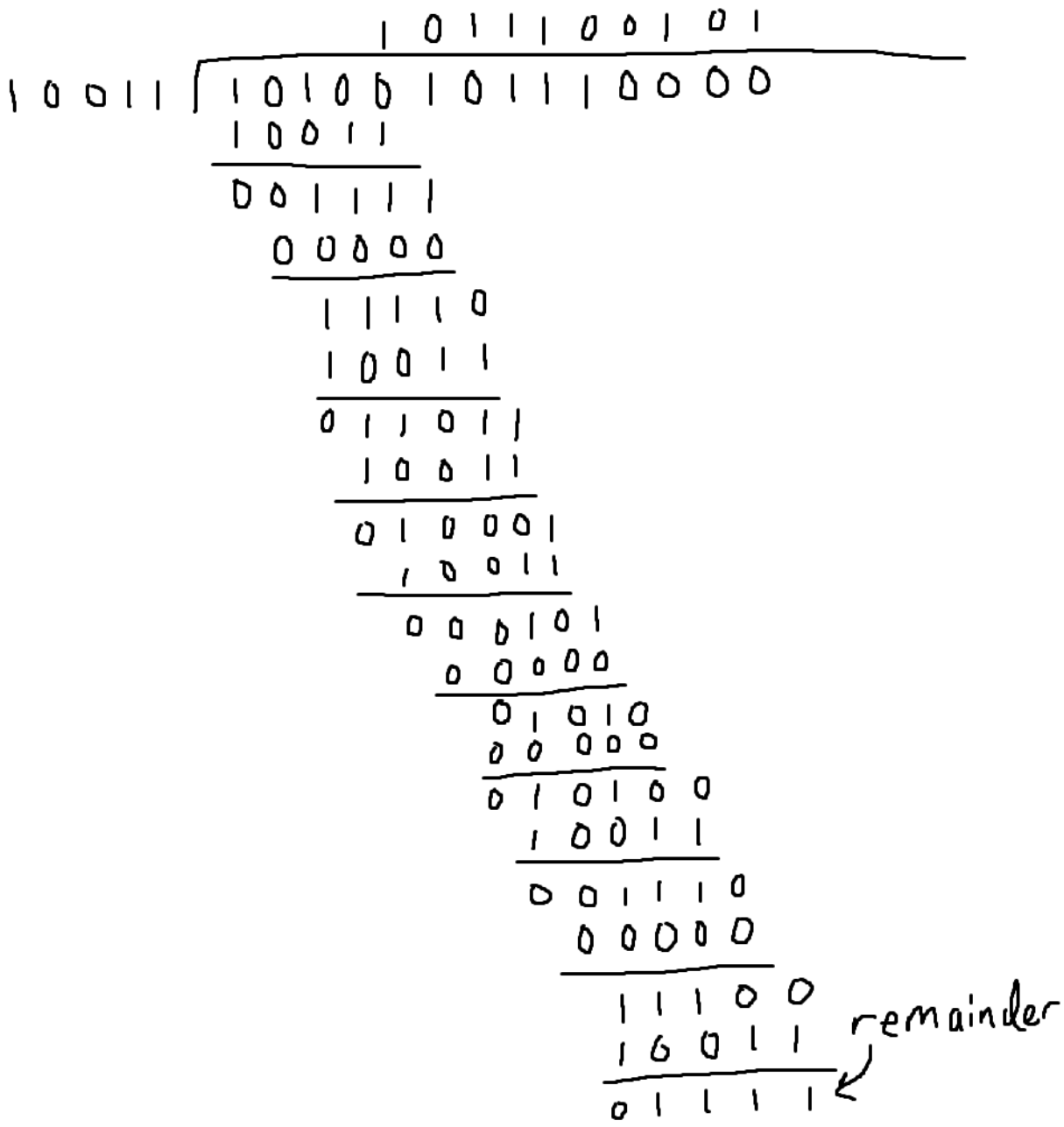






Final sent is 1111001010111 for error correction.

6. The bit string sent will be 10100101110000. The 4 additional zeros are because with G(x) = x^4 + x + 1 the highest polynomial is 4 which means that is what r is equal to. If the least significant bit is flipped the receiver will receive the bitstring 10100101110001. To detect the error, divide G(x) into the received string.



Because the remainder is non zero that means that the receiver will detect an error.