**Assignment-4 Report**

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Q1

**Q2 CRC (Cyclic Redundancy Check)**

**Objective**

Error detection in data transferred over network

**Specifications**

* Generally used at data link layer
* Operate on data bits
* Client and server should agree upon common divisor and chunk length
* Polynomial division

**Main idea**

Data received should have remainder 0 (zero) on division by common divisor for each data chunk.

**Algorithm**

Server

1. Divide data into chunks as per chunk length.
2. If the common divisor has length N, append N-1 ‘0’ bits to chunk. These extra bits are CRC bits.
3. Find remainder on division of the modified chunk with divisor, through polynomial division.
4. Replace CRC bits with the remainder of the chunk (this modified chunk would have remainder 0 (zero)).
5. Repeat the process for all chunks.
6. Send data to client.

Client

1. Divide data into chunks (chunk length = server chunk length + divisor length - 1)
2. Divide chunk with common divisor through polynomial division.
3. If a chunk has non zero remainder there is an error in the chunk.
4. Repeat the process for all chunks.

**Proof for Zero remainder**

d → data

G → common divisor

r+1 → bits in common divisor

CRC bits → R

In modulo2 polynomial:- addition ~ subtraction ~ XOR

(d<<r) = nG + R

(d<<r) - R = nG

(d<<r) XOR R = nG → to be sent

=> R = remainder [(d<<r)/G]

Q3