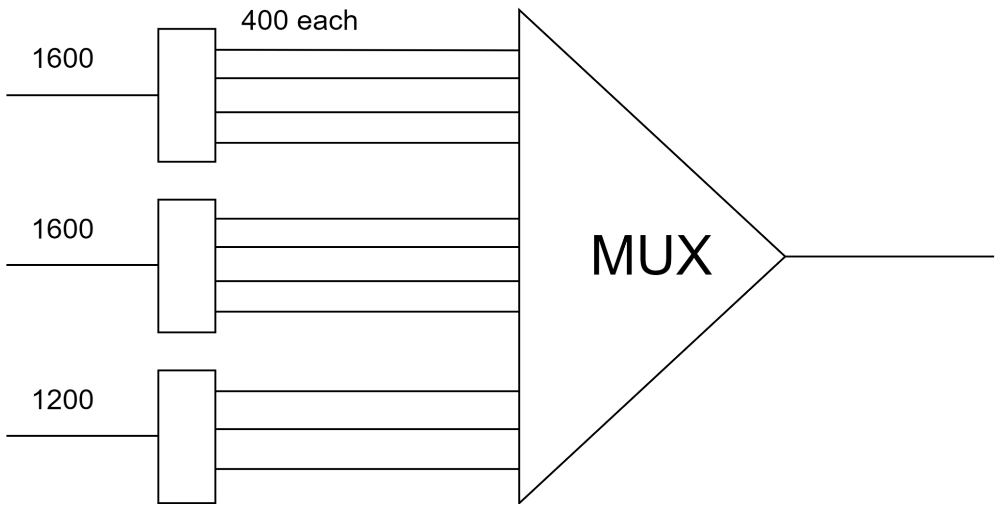
ASSIGNMENT-3

Q1

1600 kbps = 400 kbps * 4 channels
1200 kbps = 400 kbps * 3 channels



Q2

Number of channels = 10
Bitrate of each channel = 280 kbps = 280000 bps
Unit = 5 bit
Sync bit = 1 bit

a. Frame duration = Input slot duration = 5/280000 s
   Frame rate = 1/Frame duration = 280000/5 = 56000 fps
b. Input slot duration = 5/280000 s
c. Output data rate = Frame size*Frame rate = (5*10+1)*56000 = 2856000 bps
d. For output bit duration, we need input bit duration
   Input bit duration = 1/280000
   Output bit duration = Input bit duration / no of channels = (1/280000)/10 s
e. Frame size = 51 bits

Q3

Number of channels = 5
Bitrate of each channel = (6000*300*8)/60 = 240000 bps
Unit = 2 chars = 16 bits
Sync bit = 1 bit

a. Input data rate = 240000 bps
b. Input bit duration = 1/240000 s
c. Frame duration = Input slot duration = 16/240000
   Frame rate = 1/frame duration = 240000/16 = 15000 fps
d. Frame size = 16*5+1 = 81 bits

e. Output data rate = Frame size*Frame rate = 81*15000 = 1215000 bps
f. Output bit duration = (1/240000)/5

ASSIGNMENT-4

Q1

Codeword is $x^{10}+x^9+x^7+x^6+x^3+x^2+x$

$$
\begin{array}{r|l}
x^4 + x^2 + 1 & x^{10} + x^9 + x^7 + x^6 \\
 & \oplus\ x^{10} + x^8 + x^6 \\
 & x^9 + x^8 + x^7 \\
 & \oplus\ x^9 + x^7 + x^5 \\
 & x^8 + x^5 \\
 & \oplus\ x^8 + x^6 + x^4 \\
 & x^6 + x^5 + x^4 \\
 & \oplus\ x^6 + x^4 + x^2 \\
 & x^5 + x^2 \\
 & \oplus\ x^5 + x^3 + x \\
 & x^3 + x^2 + x
\end{array}
$$

Dividend (Polynomial): $x^6 + x^5 + x^3 + x^2$
Divided by: $x^4 + x^2 + 1$

Remainder is: $x^3 + x^2 + x$

Q2

Calculate Hamming distance of each pair (Ans: 7,3,4,6,5,5)
Minimum Hamming distance, $d_{min} = 3$
Error detection, $d_{min} = s+1 \therefore s = 2$
Error correction, $d_{min} = 2t+1 \therefore t = 1$

Received codeword = 10101010
Calculate Hamming distance of each valid codeword with the received codeword
d(10101010, 11110000) = 4
d(10101010, 00001101) = 5
d(10101010, 10111010) = 1
d(10101010, 01110111) = 6

Hamming distance 1 means there is a single bit error. As we can correct upto 1 bit (t=1), we can retrieve the correct dataword from 10111010, which is 10

Q3

a. Start of transmission = 2:00:00 PM
   T_p = 10 mins
   $T_{fr} = 2 \times T_p = 2*10 = 20$ minutes
   ∴ Time after completing transmission = 2:20:00 PM

b. If transmission is stopped at even 2:19:59 PM, and the collided bit returns at 2:20:00, then the collision cannot be detected.