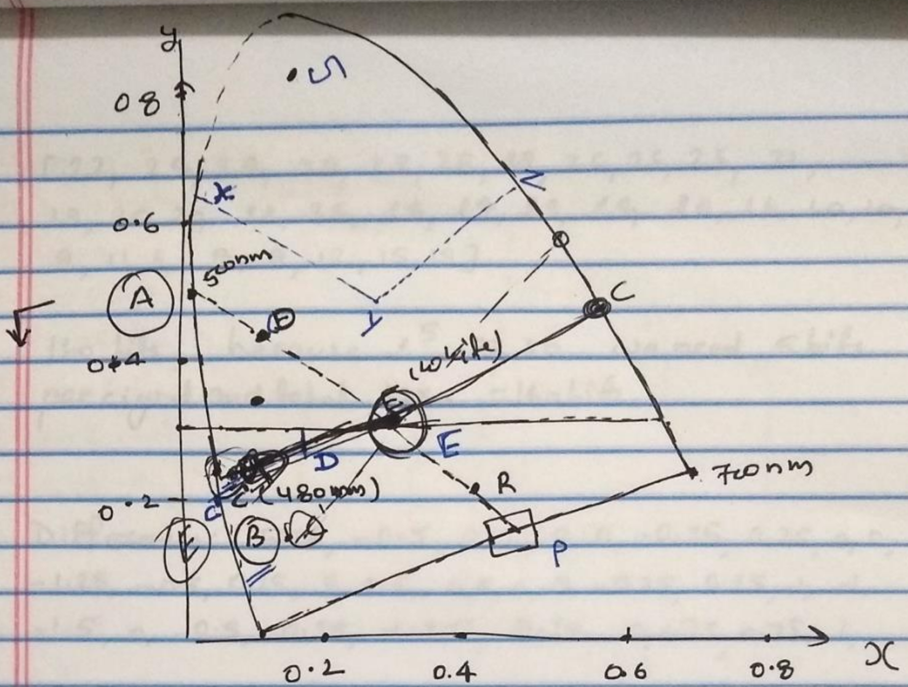


(i) point (A) is the dominent wavelength of color D (appox).
and ~~E~~ D points comes under possible ~~green~~ Blue range.
The wavelength of D could be around 270nm (grater than B and < E

(3) point (B), mention as C' is complementry color of point (C)
and C' is dominent wavelegths of 480nm.
C' is represented by blue color.
Combination of C and C' gives white color point(E).

(2). No, for color R, it can be produced by combination of E and P
However, color P can not be produced or represented by
One wavelength.

(4 and 5) $r = \frac{R}{R+G+B}$, $g = G/_{R+G+B}$, $b = B/_{R+G+B}$. $G = .5$, (Q 4 and 5 ans of both.)

The line $X \to Y$, $Y \to Z$ represents $G = .5$ because it is where $X \to Y$ is points are middle of (Blue, Green) and similarly $Y \to Z$ line for (Green, Red).

Q.2.

(i) [22, 24, 24, 28, 28, 28, 25, 26, 26, 26, 21, 19, 20, 29, 22, 24, 24, 24, 23, 24, 20, 16, 10, 10, 8, 11, 6, 9, 9, 12, 15, 19]

(2) 160 bits because $2^5 = 32$ so we need 5 bits per signal and total $32 * 5 = 160$ bits

(3)

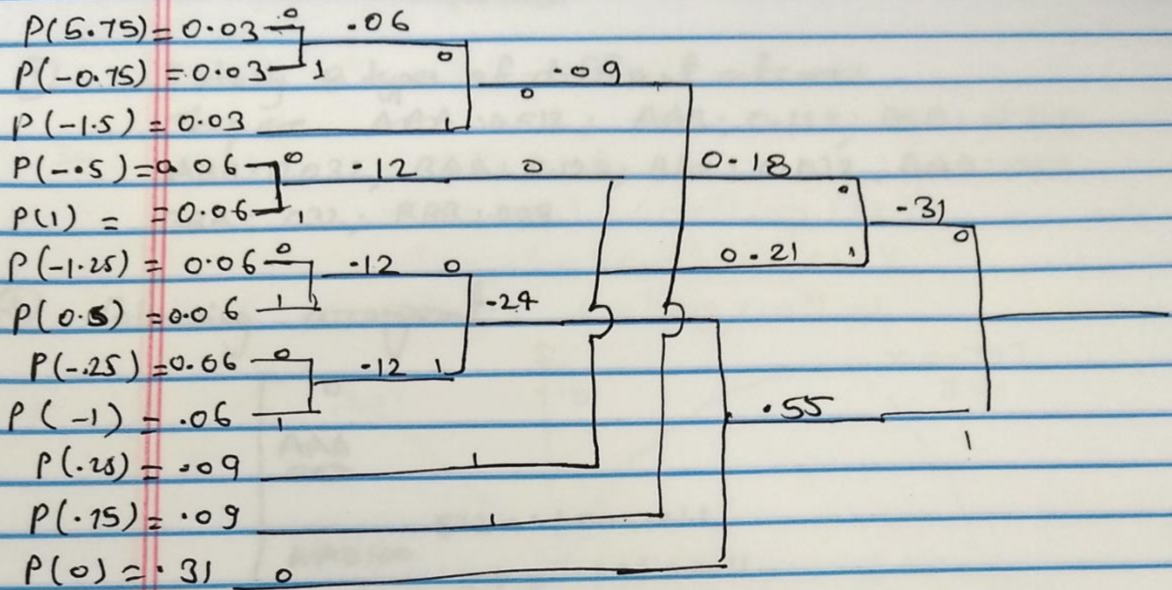
Differences: 5.75, −0.5, 0, 1, 0, 0, −0.75, 0.25, 0, 0, −1.25, −0.5, 0.25, 0, 0.5, 0.5, 0, 0, −0.25, 0.25, −1, −1, −1.5, 0, −0.5, 0.75, −1.25, 0.75, 0, 0.75, 0.75, 1.

max diff = 1, min diff: −1.5

$2^{3.58} = 12$, we have uniformly distributed levels between [−1.5, 1] and 1 more level for the first signal so we need 4 bits per signal, and total $32 * 4 = 128$ bits

(4) Compression ratio is 5/4

(5) Huffman coding for the differences, so we have following chart. totally 103 bits for these signals



symbol	~~Probability~~	Huffman code	~~freq~~
5.75		00000	
−0.75		00001	
−1.5		0001	
−0.5		0100	
1		0101	
−1.25		1000	
0.5		1001	
−1		1011	
0.25		001	
0.75		011	
0		11	

So new Compression ratio is $160/103 = 1.6$

Q.3

Arithmetic Compression:

① Totally 8 types of different outcomes.
They are AAA :0.512; AAB: 0.128; ABA: 0.128
ABB: 0.032; BAA: 0.128; BAB: 0.032; BAB: .032
BBA: 032; BBB: .008

② following arrangment:

0
AAA
000
.512 = .1000011
AAB 100 .64 = .10100011
ABA 101 .768 = .11000100
ABB 1100 .8 = .11001100
BAA 1101 .928 = .11101101
BAB 1110 .96 = .11110101
BBA 11110 .992 = .11111101
BBB 11111 1

③ Avg code length is 2+3+3+4+4+4+5+5/8 = 3.375

④ Bits for message "ABA(3) BBA (5) ABB(4) AAA(2) BBB(5)" is 3+5+4+2+5 = 19 bits.

⑤ By stoping the shrink when the interval bounds get too close can impure code length.

Q4. Entropy:

(i) $P(x) = x^2$; $P(y) = (1-x^2)$

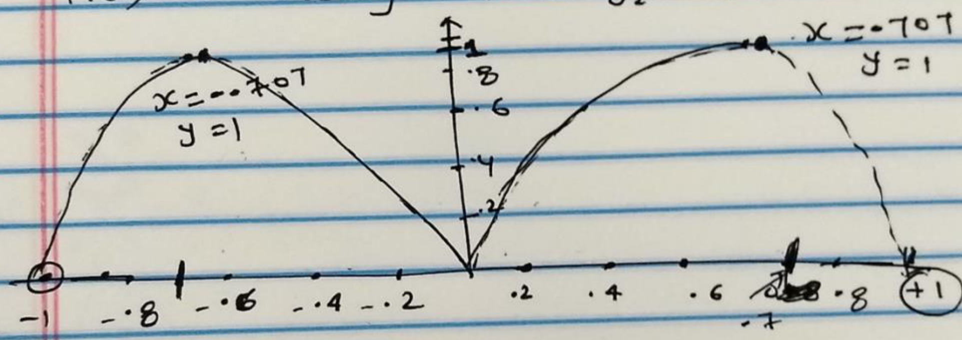
so $H(x) = -\sum P_i \log P_i$

$= -x^2 \log_2 (x^2) - (1-x^2) \log_2 (1-x^2)$

$= -x^2 \log_2 x^2 - 1 + x^2 \log_2 (1-x^2)$

$H(x) = -2x^2 \log x + x^2 \log_2 (1-x^2) - 1$

(ii)



(iii) Minimum entropy can occure in the case where only one symbol is present in the entire gamut.

$P(x) = 1$ or $P(y) = 1$

$x^2 = 1$ or $1 - x^2 = 1$

$x = \pm 1$ or $x = 0$

so entropy will be minimum at $x = \pm 1, 0$

(iv) Eentropy will be maximum when both probabilitrey are equal $P(x) = P(y)$

$1 - x^2 = x^2$

$x^2 = \frac{1}{2} \Rightarrow x = \pm 1/\sqrt{2}$

$x = \pm 0.707$