Q1.

1. The color we see under different colors of light is what the ink reflects. For example, under blue light the ink on the cube will either reflect blue light or nothing(which you will see black). The reason why some colors glow(yellow under blue light) is because the blue light might not be pure blue, thus the yellow reflects the color we see.
2. Pure red is harder, since yellow light contains red light and green light(can identify more colors), while pure red light contains only red light.

Q2.

1. Prove Z = [(1-x-y)/y] Y
   Since x,y,z is normalized (1-x-y)=z
   Z = [z/y] Y -> Zy = zY this is true because Z ∝ z and Y ∝ y

2. This algorithm will work effectively for monochrome but not necessarily for different colors, since for different colors, difference in monitor vs printer color may vary.

3. This algorithm will work better on constant color tone, since under constant color tone the difference between the color on the monitor and the printed color can be in a closer range for each color. While under different color tones, some colors might not need to adjust and some might adjust by a lot.

4. Another way is to MAP the RGB from monitor to CMY from printer by scale. Since the conversion is by scale the difference for each pixel (before conversion and after conversion) will be proportional.

Q3.

1. H = -sum(Pi * log2(Pi))
   = -sum(x^k * log2(x^k)) for k = 2
   = -(x^2 * log2(x^2) + (1-x^2) * log2(1-x^2))

2. H is at its minimum when x = (+-)1 or 0 for k=2

3. For k is even H is at its minimum when x = (+-)1 or 0
   For k is odd H is at its minimum when x = 1 or 0

4. H is at its minimum when x = (+-)0.5^0.5 for k=2

5. For k is even H is at its minimum when x = (+-)0.5^(1/k)
   For k is odd H is at its minimum when x = 0.5^(1/k)

Q4

1.
   From 3
   Paris 2

I 2
You 2
Hello 1
Got 1
This 1
Postcard 1
The 1
Louvre 1
Would 1
Love 1
Hope 1
To 1
Hear 1

0		0	0	0	to
				1	hear
			1	0	love
				1	hope
		1	0	0	Louvre
				1	would
1	0		1	0	the
				1	postcard
			0	0	this
				1	got
			1	0	hello
				1	I
	1	0	0		you
			1		Paris
		1			From

1010111110110111001100010111111010010011000101001011011011001100000001111
1100
The average code length is 77 bits

2. STOP 3
   YOU 2
   FROM 2
   IN 1
   PARIS 1
   POSTCARD 1
   LOUVRE 1
   WOULD 1
   LOVE 1
   HOPE 1
   HEAR 1

	0	0			STOP
		1	0		YOU
			1		FROM
	1	0	0	0	IN
				1	PARIS
			1	0	POSTCARD
				1	LOUVRE
		1	0	0	WOULD
				1	LOVE
			1	0	HOPE
				1	HEAR

   10001001101001110110001011001101001110111011010

   The average code length is 50 bits

3. The postcard contains more information since the given telegram message is a simplified version of the postcard message. The postcard contains more detail than the telegram. For example a message in the telegram is “IN PARIS POSTCARD FROM LOUVRE STOP YOU WOULD LOVE STOP”. From the message it is hard to tell you would love what, Paris or postcard. But from the message on the postcard it is easy to tell.