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CS 576 – Assignment 1

Q.1

a) With Subsampling at 4:2:0, there are 32 bits for y, 16 for U and 0 for V, making it an average of 12 bits per pixel, so the bit rate = 450 x 520 x 12 x 25 = 70200000
   - **i) 70.2 Mbps**

b) The average bits per pixel goes down to 11 in this scenario, making the bit rate 64.35 Mbps. This means the 10 minute video will be 10 x 60 x 64.35 = 38610000000 bits, which will need a hard drive of about:
   - **i) 4.8 GB**

Q.2

a) 23, 24, 24, 28, 29, 29, 26, 27, 27, 27, 22, 20, 20, 20, 23, 24, 24, 24, 23, 25, 20, 16, 11, 11, 9, 11, 7, 9, 9, 13, 16, 19

b) 32 levels, log32=5, so 5 bit sample rate, and the sequence is 32 numbers long so, 32 x 5 = 160 bits
   - **i)** 160 bits

Q.3

a) Circumference = Pi * Diameter = 1.333m & 36 km/h = 10 m/s, so rate of rotation is 36 / 1.333 = 7.5 rotations/second, which can be viewed when recorded/viewed at 24 frames per second
   - **i) 7.5 rotations/second**

b) There will definitely be aliasing when recording a wheel moving at 7.5 rotations per second at 8 frames per second. This second camera doesn't capture as much rotation information per second and the rotation rate it sees will be much slower, .5 rotations per second.

c) SPEED / 1.333m = (30fps / 2) = 15 rotations per second, so SPEED = 15*1.333 = 19.995 m/s
   - **i) 19.995 m/s**
   - ii) * Assuming this NTSC camera is recording the actual car, not the movie theater screen