CSc 461/561
Multimedia Systems
Assignment 1

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Q1 (1): Nyquist Theorem

- Sampling frequency
- Signal frequency
  - "true" frequency
- Alias frequency

Q2 (2): SQNR

- Ratio: P_1/P_2
- Ratio in B: $\log_{10} P_1/P_2$
- Ratio in dB: $10 \log_{10} P_1/P_2$
- Assume P is proportional to V^2
- $10 \log_{10} P_1/P_2 = 10 \log_{10} (V_1/V_2)^2$
  $= 20 \log_{10} V_1/V_2$

Q3 (1): ADPCM

- Predictor
  - make prediction based on history prediction and prediction error
- Adaptive quantizer
  - adjust quantization step according to the range of input (e.g., prediction error)

Q4 (1): color space

- RGB => YUV
- Why?

Q5 (1): gamma correction

- Observation
  - brightness (e.g., in CRT) is proportional to output voltage raised to gamma
- Gamma correction
  - let the output value be proportional to the input value raised to $(\text{gamma})^{-1}$
- Result
  - brightness is linear to the input value

Q6 (1): chroma subsampling

- 4:4:4
  - 4 Y 4U 4V samples for every 4 pixels in a line
- 4:2:2
  - 4 Y 2U 2V samples for every 4 pixels in a line
- 4:1:1
  - 4Y 1U 1V samples for every 4 pixels in a line
- 4:2:0
  - 4Y 1U 1V samples for every 2x2 pixels

Q7 (1): interlaced scanning

- Field rate
  - PAL: 50Hz; NTSC: 60Hz
- Interlaced scanning
  - one frame = two fields
- Frame rate
  - PAL: 25Hz; NTSC: 30Hz
- Why?
  - fluorescence