EENG 3810/CSCE 3020
Quiz 1 Key

1. Draw a typical communication system model and explain each block

The **source** originates a message, the **Input Transducer** converts nonelectric into an electric waveform called a message or baseband signal using physical devices, **Transmitter** modifies the baseband signal for efficient transmission and may consist of A/D converter, an encoder, and a modulator. **Channel** is the Medium that convey the electric signals at the transmitter output over a distance, **Receiver** reprocesses signals received from the channel by reversing signal modifications made at the transmitter. Removal of noise due to channel, **Output Transducer** converts electric signal to its original form, **Destination** is Unit to which message is communicated.

2. What is the difference between a digital and an analog message?
A digital message is an ordered combination of finite symbols or codewords and an analog message is data whose values vary over a continuous range of time

3. What is the purpose of regenerative repeater in digital communications?
Repeater prevents accumulation of noise and distortion along the path by cleaning pulses at regular repeater intervals

4. Today almost all new communication system being installed is digital. Why?
Advent of optical fiber communication, Dramatic cost reduction in fabrication of high speed digital circuitry and digital storage

5. What are the two main steps in Analog to Digital (A/D) conversion? Explain each
sampling and quantization, sampling - grabbing of signals at discrete time, Quantization – It is the rounding off of sample values into the nearest quantized level.

6. What is frequency Spectrum?
Specifies the relative magnitude of various frequency component of a signal

7. What is the sampling theorem?
if the highest frequency in signal spectrum is B (in Hz), the signal can be reconstructed from its discrete samples taken uniformly at a rate not less than 2B samples per second

8. What are the important factors to consider when designing a communication system? Explain each
Channel and signal characteristic, Relative noise strength, Maximum number of bits that can be transmitted over a channel per second, Signal quality

9. Explain what the bandwidth of a channel is.

Range of frequencies that it can transmit with reasonable fidelity

10. What is the Shannon theory? Attempt to give the Shannon capacity equation

   It establishes that given a noisy channel with information capacity $C$ and information transmitted at a rate $R$, then if $R < C$, there exists a coding technique which allows the probability of error at the receiver to be made arbitrarily small. This means that theoretically, it is possible to transmit information without error up to a limit, $C$.

   \[ C = B \log_2(1 + \text{SNR}) \]

11. What is modulation? Why would we modulate in a communication system

   Baseband signal is used to modify (i.e. modulate), some parameter of RF carrier signal.

   Purpose: Ease of radiation/Transmission