Communication Systems 3 (ENG3014)
Tutorial 1

Q1   Frequency analysis is important for measuring the performance of telecommunication systems.

(a) Explain the difference between discrete time and continuous time.   [2]

(b) Sketch plots for time domain and frequency domain of a Sine Wave, Square Wave with a 50% duty cycle and Square Wave with a 75% duty cycle that are obtained from discrete sampling. Please explain why these plots look the way they do.   [7]

(c) Explain the Nyquist Sampling Theorem and why this is important in the context of discrete sampling of continuous time signals   [3]

Q2   You want to decide on a suitable ADC for recording signal that varies between 0.2 V and 5V with a dynamic range of 36dB.

(a) What is the voltage resolution you need within your ADC?   [2]

(b) You measure the background noise in your measure system to have an RMS voltage of 0.1V. Determine the bit depth of the ADC you require to record the signal, making reference to effective number of bits and the number of bits in the ADC you will choose. Justify your reason for the choice of ADC.   [6]

Q3   A communication link is required for a wireless transmission system with 200 Mhz of available bandwidth. The channel has a signal to noise ratio greater than 18 dB. It is required to develop a suitable communication system that would maximise the available channel capacity for this communication system.

(a) For this link, choose a form of modulation and explain why it will maximise the achievable channel capacity.   [2]

(b) Draw a diagram of the components used in both the sender and the receiver. In the diagram, sketch how these components are connected together including any antenna and amplifiers required.   [8]

(c) Explain the purpose of each of these components mentioned above.   [10]