‘SIGNALS’ Revision

1. Basic SIGNALS and their SPECTRA.

(a) Definitions of basic signals found in the Fourier Transforms of Basic Functions table, examples: rect, sinc, tri, etc. Know how each is defined.

(b) Application of entries in the Fourier transforms and properties tables. (Proofs for entries not required.)

2. Spectrum and Energy Spectral Density of an ENERGY signal.

(a) Decomposition of an energy signal into basic signals then use Fourier transform and properties tables to determine the spectrum of the composite signal.

(b) Extraction of signal parameters from spectrum. For example, 3dB bandwidth, DC component and total energy.

(c) Relationship between magnitude spectrum, phase spectrum, energy spectral density and total energy.

3. Spectrum and Power Spectral Density of a POWER signal.

(a) Discrete-frequency spectrum, X_k, of a periodic signal (Fourier Series Coefficients).

(b) Continuous-frequency spectrum, $X(f)$, of a periodic signal. (Fourier Transform).

(c) Relationship between $X(f)$ and X_k of a periodic signal.

(d) Formation of a periodic signal given the generating function and fundamental period.

$$GENERATING\ function \circledast COMB\ function$$

(e) Determination of the spectrum of periodic signal given the generating function and fundamental period.

$$\Im\{GENERATING\ function\} \times \Im\{COMB\ function\}$$

(f) Extraction of signal parameters from spectrum. For example, DC component and average power.

(g) Relationship between magnitude spectrum, phase spectrum, power spectral density and average power.

4. Continuous-time Sampling and Reconstruction of Signals.

(a) Application of the Nyquist theorem in signal sampling.

(b) Formation of a sampled signal given the signal and sampling period.

$$SIGNAL \times COMB\ function$$

(c) Determination of the spectrum of a sampled signal given the signal and sampling period.

$$\mathfrak{I}\{SIGNAL\} \circledast \mathfrak{I}\{COMB\ function\}$$

(d) Ideal filters. Reconstruction of a signal from its sampled version and conditions for perfect reconstruction.

(e) Advantages/disadvantages of oversampling.