Signals and Systems Revision Cheat Sheet

Your Name — Course code: EE–000

Continuous-time signals

Linearity: $T\{ax_1 + bx_2\} = aT\{x_1\} + bT\{x_2\}$.
Energy: $E_x = \int_{-\infty}^{\infty} |x(t)|^2\,dt$.
Power: $P_x = \lim_{T\to\infty} \frac{1}{2T}\int_{-T}^{T} |x(t)|^2\,dt$.

Transforms

$$X(j\omega) = \int_{-\infty}^{\infty} x(t)e^{-j\omega t}\,dt, \qquad x(t) \longleftrightarrow X(j\omega).$$

Shift: $x(t-t_0) \leftrightarrow e^{-j\omega t_0}X(j\omega)$.
Convolution: $x * h \leftrightarrow XH$.
Differentiation: $dx/dt \leftrightarrow j\omega X$.

LTI systems

Impulse response: $h = T\{\delta\}$ and $y = x * h$.
Causality: $h(t) = 0$ for $t < 0$.
Stability: $\int |h(t)|\,dt < \infty$.

Filter	$H(j\omega)$	cutoff
RC low-pass	$1/(1 + j\omega RC)$	$1/RC$
RC high-pass	$j\omega RC/(1 + j\omega RC)$	$1/RC$

Sampling

For a band-limited signal, choose $f_s > 2f_{\max}$ to avoid aliasing. An anti-aliasing filter should remove energy above the Nyquist frequency before conversion. Quantisation adds approximately $\Delta^2/12$ noise power for a uniform quantiser.

Problem checklist

1. State assumptions and units.
2. Draw the system boundary and identify input and output.
3. Choose one transform convention and keep its signs consistent.
4. Check limiting cases and dimensions.
5. Interpret the numerical result in one sentence.

Exam workspace

Common pitfalls

Sign errors in Fourier exponents; forgetting initial conditions; confusing frequency in hertz with angular frequency; reporting a magnitude without units.