ECS332 2012/1 Formula Sheet

ID3	
012	$H(x) = \sum_x p_X(x)(-\log_2 p_X(x)) = \mathbb{E}[-\log_2 p_X(x)]$ $\log_2 x = \frac{\log_{10} x}{\log_{10} 2}$
020	nonsingular if "1:1" (if $x_1 \neq x_2$, then $C(x_1) \neq C(x_2)$)
055	Nyquist f. = $f_s/2$ N. sampling rate = $2f_{max}$ N. sampling interval = $1/(2f_{max})$
123	$1[\lvert t\rvert \le a] \xrightarrow{F} \frac{\sin(2\pi f a)}{\pi f} = 2a\,\mathrm{sinc}(a\omega)$ $g(at) \xrightarrow{F} \frac{1}{\lvert a\rvert} G\left(\frac{f}{a}\right)$ $G(t) \xrightarrow{F} g(-f)$
188	Ideal Samp $Ш_{T_s}(t) = \sum_{k=-\infty}^{\infty} \delta(t-kT_s) \xrightarrow{F} f_s \sum_{k=-\infty}^{\infty} \delta(f-kf_s)$
209	$P_{RC}(f;\alpha) = \begin{cases} 1 \\ \cos(\pi T\alpha f \end{cases}$ $B = \frac{1+\alpha}{2T}$ $\frac{\alpha}{T}$ = cosine length $\pm\frac{1}{2T}$ = center cosine point
220	$F_X(x) = \int_{-\infty}^{x} \frac{1}{\sqrt{2\pi}\sigma} \cdot e^{-\frac{1}{2}\left(\frac{t-m}{\sigma}\right)^2} dt = \Phi\left(\frac{x-m}{\sigma}\right)$
339	$\mathrm{sinc}(2\pi a t) \xrightarrow{F} \frac{1}{2a} 1[\lvert f\rvert \le a]$, $\mathrm{sinc}(2\pi f_0 t)$ is Bandlimited to $B = f_0$, $f_s = 2B$
388	If $\sum_k P(f - \frac{k}{T}) \equiv T$ then no ISI → Nyquist pulses T = symbol duration
467	$g(t-t_1) \underset{F^{-1}}{\overset{F}{\rightleftarrows}} e^{-j2\pi f t_1} G(f)$ / $e^{j2\pi f_1 t} g(t) \underset{F^{-1}}{\overset{F}{\rightleftarrows}} G(f-f_1)$
477	
483	pdf Gaussian $f_X(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{1}{2}\left(\frac{x-m}{\sigma}\right)^2}$ $\mathbb{E}X = m$, $\mathrm{Var}X = \sigma^2$ $X \sim \mathcal{N}(m, \sigma^2)$
527	$P_{RC}(t,\alpha) = \left\{ \cos\left(\frac{\alpha\pi t}{T}\right) / 1 - \frac{4\alpha^2 t^2}{T^2} \right\} \times \mathrm{sinc}\left(\frac{\pi t}{T}\right)$
610	$\mathbb{E}[l(x)] = \sum_n l(x) p_X(x)$, $\mathrm{Var}\,N = \mathbb{E}[N^2] - (\mathbb{E}N)^2$
627	$\hat{X}_{MAP}(y) = \arg\max_x P[X = x \mid Y = y]$
658	$g_r(t) = \sum_{n=-\infty}^{\infty} g[n]\,\mathrm{sinc}(\pi f_s(t - nT_s))$ $P_{RC}(t) = \frac{\sin(\pi \frac{t}{T})}{\pi \frac{t}{T}}$
659	prefix-free if no codeword is a prefix of another c.w.
675	$x_{FM}(t) = A\cos(2\pi f_c t + \phi + 2\pi k_f \int_{-\infty}^{t} m(\tau)\,d\tau)$ $f(t) = f_c + k_f m(t)$
709	UD if the code can decode w/o ambiguity.