ECS455 Formula Sheet

ID3	Limit: 40 symbols (or characters) per person.
012	$P_m = P_b = \frac{A^m/m!}{\sum_{i=0}^{m} A^i/i!}$ $A = \lambda/\mu$ $E_{N_i} = \lambda T_i$
020	$P_N(x) = \begin{cases} \lambda\delta, & x=1 \\ 1-\lambda\delta, & x=0 \\ 0, & \text{else}\end{cases}$
030	$B_{in} \sim N = \overset{\text{Ber}}{N_1} + \dots + N_n = \sum_{k=1}^{n} N_k \xrightarrow{n\to\infty} \text{poiss}$
097	$B(n,p) \sim P_X(x) = \begin{cases}\binom{n}{x} p^x (1-p)^{n-x}, & x=0,\dots,n \\ 0, & \text{else}\end{cases}$
123	
138	$\alpha = np_1 = \lambda T$ $P(\alpha) \sim P_X(x) = \begin{cases} e^{-\alpha}\alpha^x/x!, & x=0 \\ 0, & \text{else}\end{cases}$
161	$f_X(x) = \begin{cases}\lambda e^{-\lambda x}, & x>0 \\ 0, & x\le 0\end{cases}$
164	Markov $P[1 \text{ new call}] = \lambda\delta$ $P[1 \text{ call end}] = k\mu\delta$
171	$P[1 \text{ new call}] = (n-k)\lambda\mu\delta$ $P[1 \text{ call end}] = k\mu\delta$
172	$P_k = \frac{\binom{n}{k}A_u^k}{\sum_{i=0}^{m} \binom{n}{i} A_u^i}$
220	CDMA $\to s(t) = \sum_{k=0}^{\ell-1} s_k c_k(t)$
253	$0 \to +1$ $1 \to -1$ $g(x) = 1+0x+x^2+x^3 \to R_0\ R_1\ R_2$
272	$P_b = \frac{(n-m/P_m)}{\sum^{m}(n-k)P_k}$
339	Parseval $\int_{-\infty}^{\infty} x(t)y^*(t)\,dt = \int_{-\infty}^{\infty} X(f)Y^*(f)\,df$
363	$\langle \vec a, \vec b\rangle = \sum ab = 0$ $\langle a,b\rangle = \int_{-\infty}^{\infty} ab^*\,dt = 0$ $\langle A,B\rangle = \int_{-\infty}^{\infty} ab^*\,df$ orthogonality

387	TDMA $\to s(t) = \sum_{k=0}^{\ell-1} s_k p(t-kT_s)$
388	$\hat s_k = \frac{1}{N} \langle \underline r, \underline c_k\rangle$, $C^{-1} = \frac{1}{N} C^T$ $\hat{\underline s} = \frac{1}{N} \underline r C^T$
401	$H_2 = \begin{bmatrix}1&1\\1&-1\end{bmatrix}$, $H_N H_N^T = N I_N \to 2S$
427	FDMA $\to S(f) = \sum_{k=0}^{\ell-1} S_k P(f-k\Delta f)$
477	OFDM $s(t) = \sum_{k=0}^{N-1} S_k \overbrace{\frac{1}{\sqrt{N}} 1_{[0,T_s]}(t) \exp\left(j\frac{2\pi kt}{T_s}\right)}^{c_k(t)}$
479	Fading $r(t) = x(t)*h(t)+n(t)$, $h(t) = \sum \beta_i \delta(t-T_i)$
483	$s[n] = s\left(n\frac{T_s}{N}\right) = \sqrt{N}\ \text{IDFT}\{S\}[n]$, $\Psi_N = e^{j2\pi/N} \to 3S$
486	$\Psi_N = e^{j\frac{2\pi}{N}}$, $\Psi_N = \begin{bmatrix} 1 & \cdots & \cdots & 1 \\ 1 & \Psi_N^{-1} & \cdots & \Psi_N^{-(N-1)} \\ \vdots & & & \vdots \\ 1 & \Psi_N^{-(N-1)} & \cdots & \Psi_N^{-(N-1)(N-1)} \end{bmatrix}$
577	$\Psi_N^{-1} = \frac{1}{N} \Psi_N^*$, $x = \frac{1}{N} \Psi_N^* X \Leftarrow X = \Psi_N x$
658	$s^{(L)}[n] = s\left(n\frac{T_s}{Ln}\right) = L\sqrt{N}\ \text{IDFT}\{S\}[n]$
709	$\hat S_k = \begin{cases} S_k, & 0\le k<N \\ 0, & N\le k\le LN\end{cases}$
867	$\{x*h\}[n] = \sum_m x[m]h[n-m]$
892	$[1\ 2\ 3\ 0\ 0] \circledast [4\ 5\ 6\ 0\ 0] = [1\ 2\ 3]*[4\ 5\ 6]$
950	$[1\ {-2}\ 3\ 1\ 2] \circledast [3\ 2\ 1\ 0\ 0] =$ $[1\ 2\ 1\ {-2}\ 3\ 1\ 2]*[3\ 2\ 1]$ w/ junk