ECT-261 Equations for Exam 1
Sr. Professor Wheeler

$\lambda = \frac{v}{f}$	Wavelength of a signal, given *v* (velocity) and *f* (frequency). For radio waves, $v = 3 \times 10^8$ m/s.
$BW = f_H - f_L$	The definition of bandwidth.
$P_N = KTBW$	Available noise power at absolute temperature *T*, over bandwidth *BW*. K=1.38 x 10^{-23} J/K (K value is given on tests).
$V_N = \sqrt{4KTBWR}$	Open-circuit noise voltage from an equivalent noise resistance *R* at absolute temperature *T* over bandwidth *BW*.
$K = C + 273$	Celsius to Kelvin temperature conversion
$C = \frac{5}{9}(F - 32)$	Fahrenheit to Celsius conversion
$SNR = \frac{P_S}{P_N}$	Definition of power signal-to-noise ratio, in W/W
$SNR = \left(\frac{V_S}{V_N}\right)^2$	Calculation of the power signal-to-noise ratio if the signal and noise voltages are known.
$SNR_{(dB)} = 10\log SNR$	The S/N ratio expressed in dB
$SNR_{(dB)} = 20\log\left(\frac{V_S}{V_N}\right)$	Decibel S/N ratio when V_S and V_N are known. The two voltages must be measured at the same point in the circuit.
$NF = dBSNR_{IN} - dBSNR_{OUT}$	Noise figure of a two-port network (such as an amplifier), given the decibel S/N readings at the input and output. Ideal NF is 0 dB.
$f_{USB} = f_C + f_m$ $f_{LSB} = f_C - f_m$	Frequency of the upper and lower sideband in an AM signal, given carrier and information frequencies
$BW = 2f_{m(MAX)}$	Calculated bandwidth of an AM signal
$V_{USB} = V_{LSB} = \frac{V_m}{2}$	Voltage of upper and lower sidebands in an AM signal
$m = \frac{V_{MAX} - V_{MIN}}{V_{MAX} + V_{MIN}}$	Measurement of AM modulation index in the time domain
$m = \frac{V_m}{V_C}$	Definition of AM modulation index in the frequency domain
$P_T = P_{LSB} + P_C + P_{USB}$	Conservation of energy; total power in a modulated signal
$P_T = P_C\left(1 + \frac{m^2}{2}\right)$	Total power in an AM signal if carrier power and modulation index are known.
$\sum P_{SIDE} = P_C\frac{m^2}{2} = P_{LSB} + P_{USB}$	Total sideband (information) power in an AM signal, given carrier power and modulation index. This equation is the right-hand distributed term from the total power equation above.
$\eta = \frac{P_I}{P_T}$	Efficiency of an information system; P_I is the information power, P_T is the total transmitted power. Maximum of 33.3% in AM.