EECE 598, Homework 05, SOULTIONS

6.1 From Eqs. (6.4) and (6.5) with $R_f = 0$, $\eta = 1 - \exp(-\alpha_s w)$

To assist in making the plots, from Fig. 6.18, we have the following representative values of the absorption coefficient:

λ (μm)	α_s (cm^{-1})
.60	4.4×10^3
.65	2.9×10^3
.70	2.0×10^3
.75	1.4×10^3
.80	0.97×10^3
.85	630
.90	370
.95	190
1.00	70

6.3 From Eq. (6.1), $\frac{P(x)}{P_{in}} = e^{-1} = e^{-\alpha x}$ yields $x = 1/\alpha = 1/(0.05\ \mu m^{-1}) = 20\ \mu m$

6.6 Same problem as Example 6.8: compare Eqs. (6.13), (6.14), and (6.17).

(a) First from Eq. (6.6), $I_p = \frac{\eta q \lambda}{hc} P_0 = 0.593\ \mu A$

Then $\sigma_Q^2 = 2qI_pB = 2\left(1.6\times10^{-19}\ C\right)(0.593\ \mu A)(150\times10^6\ Hz) = 2.84\times10^{-17}\ A^2$

(b) $\sigma_{DB}^2 = 2qI_DB = 2\left(1.6\times10^{-19}\ C\right)(1.0\ nA)(150\times10^6\ Hz) = 4.81\times10^{-20}\ A^2$

(c) $\sigma_T^2 = \frac{4k_BT}{R_L} B = \frac{4\left(1.38\times10^{-23}\ J/K\right)(293\ K)}{500\ \Omega}\left(150\times10^6\ Hz\right) = 4.85\times10^{-15}\ A^2$