Cheat Sheet

Link Budgets:

$$P_T = P_s - P_R = ml_c + nl_{sp} + \alpha_f L + \text{System Margin}$$

$$t_{sys} = \left[t_{tx}^2 + t_{mod}^2 + t_{GVD}^2 + t_{rx}^2 \right]^{1/2} = \left[t_{tx}^2 + \left(\frac{440 L^q}{B_0} \right)^2 + D^2 \sigma_\lambda^2 L^2 + \left(\frac{350}{B_e} \right)^2 \right]^{1/2}$$

Optical transmitters:

$$\Gamma g_{th} \geq \alpha_{total} = \alpha + \frac{1}{2L} * \ln\left(\frac{1}{R1 * R2}\right)$$

$$\Delta \nu = \frac{c_0}{2nL} \qquad \lambda_B = \frac{2 n_{eff} \Lambda}{l},$$

$$1/\tau_{ph} = \frac{c_o}{n} \alpha_{total} = \frac{c_o}{n} \Gamma g_{th} = \frac{c_o}{n} \left[\alpha + \frac{1}{2L} * \ln\left(\frac{1}{R1 * R2}\right) \right]$$

$$\eta_{ext} = \eta_{\text{int}} \frac{g_{th} - \alpha}{g_{th}} = \frac{q}{E_g} * \frac{dP}{dI} = 0.8065 * \lambda(\mu m) * \frac{dP(mW)}{dI(mA)}$$

$$\frac{dn}{dt} = \frac{J}{ed} - G(n)S - \frac{n}{\tau_n},$$
$$\frac{dS}{dt} = G(n)S - \frac{S}{\tau_{ph}} + \beta_{sp} \frac{n}{\tau_r}.$$

Optical receivers:

$$I_p = R P_{\text{in}},$$

$$R = \frac{\eta q}{h\nu} \approx \frac{\eta \lambda}{1.24},$$

$$\eta = P_{\text{abs}} / P_{\text{in}} = 1 - \exp(-\alpha W).$$

$$\tau_{\text{tr}} = W / v_d.$$

$$\tau_{RC} = (R_L + R_s) C_p,$$

$$\Delta f = \frac{1}{2\pi(\tau_{tr} + \tau_{RC})}$$