

# ELEG 309 Formula Sheet

Second Midterm Exam

April 25, 2000

$$i_C = I_S e^{v_{BE}/V_T} \quad (1)$$

$$i_C = \beta i_B = \alpha i_E, \quad i_E = (\beta + 1)i_B \quad (2)$$

$$i_E = i_B + i_C \quad (3)$$

$$\alpha = \frac{\beta}{\beta + 1}, \quad \beta = \frac{\alpha}{1 - \alpha} \quad (4)$$

$$i_c = g_m v_\pi, \quad V_T \simeq 25 \text{ mV} \quad (5)$$

$$g_m = \left. \frac{\partial i_C}{\partial v_{BE}} \right|_{i_C=I_C} \quad (6)$$

$$r_\pi = \frac{v_{be}}{i_b} = \frac{\beta}{g_m}, \quad r_e = \frac{v_{be}}{i_e} = \frac{\alpha}{g_m}, \quad r_\pi = (\beta + 1)r_e \quad (7)$$

$$g_m = \frac{I_C}{V_T}, \quad r_e = \frac{V_T}{I_E}, \quad r_\pi = \frac{V_T}{I_B}, \quad r_o = \frac{V_A}{I_C} \quad (8)$$

$$\frac{v_o}{v_b} = -\frac{\alpha R_C}{r_e + R_e} \quad (9)$$