

ECE 3040 Quiz 7 – July 6, 2005

Professor Leach

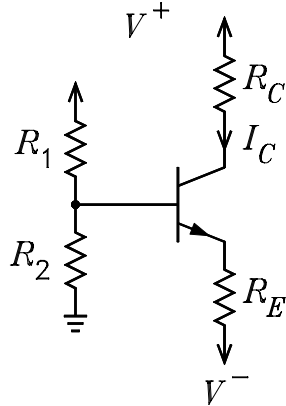
Printed Name \_\_\_\_\_

**Instructions.** Place a box around your answers. Express numerical answers as a decimal number.

Place a box around all numerical answers. **Honor Code Statement:** *I have neither given nor received help on this quiz.* Initials \_\_\_\_\_

The figure shows a BJT bias circuit. It is given that  $V^+ = 18\text{ V}$ ,  $R_E = 7.5\text{ k}\Omega$ ,  $R_1 = 110\text{ k}\Omega$ ,  $R_2 = 36\text{ k}\Omega$ ,  $R_C = 2.4\text{ k}\Omega$ ,  $V_{BE} = 0.7\text{ V}$ , and  $\beta = 94$ .

- (a) Solve for  $V^-$  for  $I_E = 2\text{ mA}$ .  
 (b) Verify that the BJT is biased in the active mode.



$$V_p := 18 \quad R_E := 7500 \quad R_1 := 110000 \quad R_2 := 36000 \quad R_C := 2400 \quad V_{BE} := 0.7 \quad \beta := 94$$

$$\alpha := \frac{\beta}{1 + \beta} \quad V_m := -12$$

$$V_{BB} := V_p \cdot \frac{R_2}{R_1 + R_2} \quad V_{BB} = 4.438 \quad R_{BB} := R_p(R_1, R_2) \quad R_{BB} = 2.712 \cdot 10^4$$

$$I_C := \frac{V_{BB} - V_m - V_{BE}}{\frac{R_E}{\alpha} + \frac{R_{BB}}{\beta}} \quad I_C \cdot 1000 = 2$$

$$V_{CB} := (V_p - I_C \cdot R_C) - \left( V_m + \frac{I_C}{\alpha} \cdot R_E + V_{BE} \right) \quad V_{CB} = 9.338$$