Quiz: Solutions

Cutoff Mode

What are two equality equations for cutoff mode? (hint: three possibilities, but there are only 2 independent equations)

$i_E=i_B=i_C=0$

What are two inequality equations for cutoff mode? (hint: think about how the PN junctions must be biased)

$v_{BE} < 0.7$
$v_{BC} < 0.5$

Saturation Mode

What is the equation for iC in Saturation mode?

$i_C = I_S\, exp(v_{BE}/V_T) - (I_S/\alpha_R)exp(v_{BC}/V_T)$
$i_C = I_S\, exp(v_{BE}/V_T)(1 - (1/\alpha_R)exp(-v_{CE}/V_T))$

If you take iC equation in Saturation mode and consider a large value of v_{CE}, how can you approximate it? (hint (maybe): if v_{CE} is a large positive value what does that do to v_{BC}?)

Active Mode

What is the equation for iC in active mode?

$i_C = I_S\, exp(v_{BE}/V_T)$

What is another enforcing equation for active mode?

$i_C = \beta i_B$

What are two inequality equations for active mode? (hint: think about how the PN junctions must be biased)

$v_{CE} > 0.2V$ and $i_B > 0$