Ahmed El Gaouad

Electronics II: Test 3

(2) $R_L = R_o \parallel R_D$

$= 40000 \parallel 8000$

$= 6.7 K\Omega$

$\Rightarrow A = -g_m R_L$

$= -(5000 \times 10^{-6})(6.7 \times 10^3)$

$\boxed{A = -33.5}$

Let determine the factor β

$$\beta = \frac{-R_2}{R_1 + R_2} = \frac{-200000}{200000 + 800000} = -0.2$$

$$A_f = \frac{A}{1 + \beta A} = \frac{-33.5}{1 + (-0.2)(-33.5)}$$

$\boxed{A_f = -4.4}$

(1) we know that $A_f = \frac{A}{1 + \beta A}$

if $A = -1000$

$$A_{f1} = \frac{-1000}{1 + (-1/15)(-1000)} = -14.78$$

Let determine A_f at $A = -1000 (1.1)$

$$A_{f2} = \frac{-1000 \cdot (1.1)}{1 + (-1/15)[-1000 \cdot (1.1)]} = -14.8$$

$$\Delta A_f = \left| \frac{A_{f1} - A_{f2}}{A_{f1}} \right| \times 100\% = \left| \frac{-14.78 + 14.8}{-14.8} \right| \cdot 100\%$$

$= \left| \frac{+0.2}{-14.78} \right| \times 100\% = 0.0135 \times 100\% = 1.35\%$

$\boxed{\Delta A_f = 0.18\%}$

(3) $V_{DC} = \frac{2.4\, I_{dc}}{rC} = \frac{2.4(200)}{(0.08)(500)} = 12V$

$\boxed{V_{DC} = 12V}$

$V_m = V_{dc} + \frac{4.17\, I_{dc}}{C} = 12 + \frac{4.17(200)}{500} = 13.7V$

$\boxed{V_m = 13.7V}$

(4) $V_o = V_Z + V_{BE}$

$= 10 + 0.7 = \boxed{10.07V}$

(5) $C_T(V_R) = \frac{C(0)}{\left(1 + \left|\frac{V_R}{V_T}\right|\right)^n}$

Since the junction is diffused $n = 1/3$

$C_T(V_R) = \frac{80 \times 10^{-12}}{\left(1 + \left|\frac{4.2}{0.7}\right|\right)^{1/3}}$

therefor $\boxed{C_T = 41.82\,pF}$

(6) $C_t = 93\,pF$

$C_t = 5.6\,pF$

the Ratio = $\frac{93 \times 10^{-13}}{5.6 \times 10^{-12}}$ = **16.61**

$C_t = 80\,pF$, At a reverse potential of 1.25V

$C_t = 6\,pF$

the Ratio = $\frac{80 \times 10^{-12}}{6 \times 10^{-12}}$ = 13.33 "Decreased"