EE431 / EE531 Test Header

Seat code: _____(if applicable) **Name:_____**

Test rules: (*you are only one cheating incident away from academic misconduct*)

- ✓ Do all work on the test. Use the backside if necessary. **Extra paper is not allowed**.
- ✓ Equations/data are supplied on the test. You may have no other notes.
- ✓ **All sheets of the test must remain stapled – do not remove any page.**
- ✓ You may have **1** approved calculator as described later in this document. However, for some tests it is possible that no calculator will be allowed.
- ✓ All other papers, books, purses, bags, etc. must be off the desk and on the floor out of site.
- ✓ You may have no cell phones, pagers, etc. in view. Any devices you have with you must be OFF unless approved by the instructor.
- ✓ Your desk must be free of anything not approved – thus you have only three items: the test, your calculator (if permitted for the test), and your pencils/erasers – none of which can contain any notes.
- ✓ Caps or any kind of head gear are not allowed.
- ✓ Nothing can be in your lap or off the desktop , even if legitimate for the test.

General data and equations:

Standard R: 10 11 12 13 15 16 18 20 22 24 27 30 33 36 39 43 47 51 56 62 68 75 82 91

Standard C: 10 12 15 18 22 27 33 39 47 56 68 82

$V_{BE_{nom}}$ at 25 C = _____ volts dV_{BE}/dT = _____ mV/C

$$T_C = (T_F + 40)\left(\frac{5}{9}\right) - 40 \qquad T_F = (T_C + 40)\left(\frac{9}{5}\right) - 40 \qquad T_K = T_C + 273$$

k = 1.38E-23 J/C |e| = 1.602E-19 C

$$NG = \frac{1 + \frac{Rf}{Ri}}{1 + \frac{1 + \frac{Rf}{Ri}}{Av}} \qquad IG = \frac{-\frac{Rf}{Ri}}{1 + \frac{1 + \frac{Rf}{Ri}}{Av}} \qquad Gain = 1 + 2\left(\frac{Rf}{Rg}\right)$$

Real Op-Amp Av = _____ Ideal Op-Amp Av = infinity

Vos = _____ mV I_B = _____ nA I_{BOS} = _____ nA

En = _____ $nV/\sqrt{Hz}$ In = _____ $nA/\sqrt{Hz}$

$$Vo|_{Vos} = -Vos \times NG \qquad Vo|_{I_B} = I_B(R_I - R_N)NG \qquad Vo|_{I_{BOS}} = \left(\frac{I_{BOS}}{2}\right)(R_I + R_N)NG$$

Note: Use absolute value of the above. Note: En and In are in per root Hz units below.

$$Vn = \sqrt{4kTBR} \qquad Pn = kTB \qquad 1^{st} \text{ order: } N_{BW} = \left(\frac{\pi}{2}\right)F_{-3dB}$$

This sheet is for Test 2 and Final Exam only

$Vo_n|_{Rs} = Vn|_{Rs} \times NG$ $\quad Vo_n|_{Ri} = Vn|_{Ri} \times IG$ $\quad Vo_n|_{Rf} = Vn|_{Rf}$

$Vo_n|_{En} = (En\sqrt{B})NG$ $\quad Vo_n|_{IB+} = (In\sqrt{B})R_N NG$ $\quad Vo_n|_{IB-} = (In\sqrt{B})(Rf \parallel Ri)NG$

$\omega = 2\pi F$ $\quad Fc = \dfrac{1}{2\pi \mathrm{T}}$ $\quad GBW = Fc \times NG$

$$n = \frac{\ln\left(\dfrac{\dfrac{1}{Rs^2}-1}{\dfrac{1}{Rp^2}-1}\right)}{2\ln\left(\dfrac{Fs}{Fp}\right)} \qquad F_{CL} = \frac{Fp}{e^{\left(\frac{\ln\left(\frac{1}{Rp^2}-1\right)}{2n}\right)}} \qquad F_{CH} = \frac{Fs}{e^{\left(\frac{\ln\left(\frac{1}{Rs^2}-1\right)}{2n}\right)}}$$

$$Fc = \frac{F_{CL}+F_{CH}}{2} \qquad n = \frac{\cosh^{-1}\left[\sqrt{\dfrac{\dfrac{1}{Rs^2}-1}{\dfrac{1}{Rp^2}-1}}\right]}{\cosh^{-1}\left[Fs/Fp\right]}$$

$$\frac{\omega_n^2}{s^2+2\zeta\omega_n s+\omega_n^2} \qquad \omega_n = \frac{1}{\sqrt{R_1R_2C_1C_2}} \qquad \zeta = \frac{R_1+R_2}{2}\sqrt{\frac{C_2}{R_1R_2C_1}} \qquad \zeta = \frac{1}{2Q}$$

$C = 4\times10^{-7}/\sqrt{F_n}$ $\quad C_1 = C/\zeta$ $\quad 0.1\times\zeta^2 C_1 \prec C_2 \prec \zeta^2 C_1$ $\quad K_C = C_2/C_1$

$$K_R = \frac{2\zeta^2 - K_C + 2\zeta\sqrt{\zeta^2-K_C}}{K_C} \qquad R^2 = \frac{1}{\omega_n^2 C_1 C_2} \qquad R_1 = \sqrt{\frac{R^2}{K_R}} \qquad R_2 = \frac{R^2}{R_1}$$

discharge: $V_{(t)} = (V_{init} - V_{low})e^{-t/\mathrm{T}} + V_{low}$ $\quad$ charge: $V_{(t)} = V_{init} + (V_{high} - V_{init})(1-e^{-t/\mathrm{T}})$

$$F = \frac{1.44}{(R_1+2R_2)C} \qquad T_J = P_D\theta_{JA} + T_A$$

$$Line\_regulation = \frac{Vo@\,Line\_high - Vo@\,Line\_low}{Vo@\,Line\_nom}\times 100\%$$

$$Load\_regulation = \frac{Vo@\,no\_load \;-\; Vo@\;full\_load}{Vo@\,no\_load}\times 100\%$$

$Vres = \frac{Vspan}{2^N}$ $\quad N = \frac{\ln(\frac{Vspan}{Vres})}{\ln(2)}$