10.1 A negative-feedback amplifier has a closed-loop gain $A_f = 100$ and an open-loop gain $A = 10^4$. What is the feedback factor β? If a manufacturing error results in a reduction of A to 10^3, what closed-loop gain results? What is the percentage change in A_f corresponding to this factor of 10 reduction in A?

10.7 A newly constructed feedback amplifier undergoes a performance test with the following results: With the feedback connection removed, a source signal of 5 mV is required to provide a 10-V output to the load; with the feedback connected, a 10-V output requires a 200-mV source signal. For this amplifier, identify values of A, β, $A\beta$, the closed-loop gain.

D 10.10 A designer is required to achieve a closed-loop gain of $25 \pm 1\%$ V/V using a basic amplifier whose gain variation is $\pm 10\%$. What nominal value of A and β (assumed constant) are required?

10.16 A capacitively coupled amplifier has a midband gain of 1000 V/V, a single high-frequency pole at 10 kHz, and a single low-frequency pole at 100 Hz. Negative feedback is employed so that the midband gain is reduced to 10. What are the upper and lower 3-dB frequencies of the closed-loop gain?

***10.22** The complementary BJT follower shown in Fig. P10.22(a) has the approximate transfer characteristic shown in Fig. P10.22(b). Observe that for $-0.7\ \text{V} \le v_I \le +0.7$ V, the output is zero. This "dead band" leads to crossover distortion (see Section 11.3). Consider this follower to be driven by the output of a differential amplifier of gain 100 whose positive-input terminal is connected to the input signal source v_S and whose negative-input terminal is connected to the emitters of the follower. Sketch the transfer characteristic v_O versus v_S of the resulting feedback amplifier. What are the limits of the dead band, and what are the gains outside the dead band?

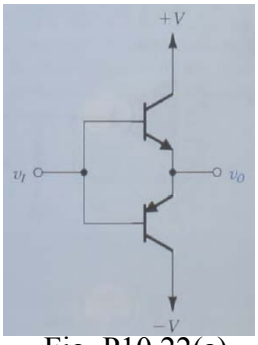

Fig. P10.22(a)

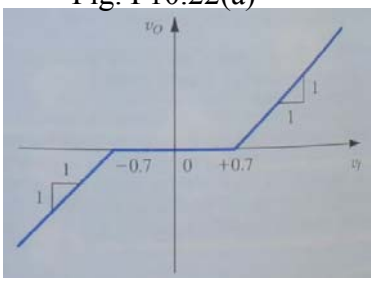

Fig. P10.22(b)

D 10.23 A particular amplifier has a nonlinear transfer characteristic that can be approximated as follows:

(a) For small input signals, $|v_I| \le 10$ mV, $v_O/v_I = 10^3$
(b) For intermediate input signals, $10\ \text{mV} \le |v_I| \le 60$ mV, $\Delta v_O/\Delta v_I = 10^2$
(c) For large input signals, $|v_I| \ge 60$ mV, the output saturates

If the amplifier is connected in a negative-feedback loop, find the feedback factor β that reduces the factor-of-10 change in gain (occurring at $|v_I| = 10$ mV) to only a 10% change. What is the transfer characteristic v_O versus v_S of the amplifier with feedback?