Homework Problems
Transistor Bias Design and Analysis and Amplifier Analysis

rev 2

Note: Problems 6 to 10 are answers to problems 1 to 5 with rounding to nearest standard values. For problems 1 through 5, calculate R_E, R_{B1}, and R_{B2}. V_{BE} = 0.65 @ 25 deg. C and has a temperature coefficient of -0.0022 Volts/degree C. Use $K_T = K_B = 1.2$. All circuits use a NPN transistor operating on a single supply of V_{CC} (V_{EE} = 0).

Bias design problems:

1. Tmin = 10, Tmax = 40, Bmin = 30, Bmax = 100, V_{CC} = 3, I_C = 5 mA.

2. Tmin = 0, Tmax = 50, Bmin = 40, Bmax = 150, V_{CC} = 5, I_C = 10 mA.

3. Tmin = 10, Tmax = 40, Bmin = 50, Bmax = 200, V_{CC} = 9, I_C = 3 mA,

4. Tmin = 0, Tmax = 70, Bmin = 80, Bmax = 250, V_{CC} = 12, I_C = 1.5 mA.

5. Tmin = -20, Tmax = 60, Bmin = 100, Bmax = 300, V_{CC} = 20, I_C = 1 mA.

Bias analysis problems: Use the nominal V_{BE} and Beta calculated from above.

6. V_{CC} = 3, R_C = 200, R_E = 62, R_{B1} = 1.6K, R_{B2} = 820

7. V_{CC} = 5, R_C = 0, R_E = 51, R_{B1} = 2.2K, R_{B2} = 750

8. V_{CC} = 9, R_C = 1K, R_E = 110, R_{B1} = 13K, R_{B2} = 1.6K

9. V_{CC} = 12, R_C = 3.3K, R_E = 470, R_{B1} = 91K, R_{B2} = 13K

10. V_{CC} = 20, R_C = 8.2K, R_E = 820, R_{B1} = 300K, R_{B2} = 27K

Amplifier analysis problems: Find Rin, Ro, Av unloaded, net gain and power gain.

11. Use circuit from problem 6. Common-emitter connection with Rsource = 250 Ohms and Rload = 300 Ohms.

12. Use circuit from problem 7. Common-collector connection with Rsource = 500 Ohms and Rload = 100 Ohms.

13. Use circuit from problem 8. Common-base connection with Rsource = 10 Ohms and Rload = 1200 Ohms.

14. Use circuit from problem 9. Common-emitter connection with Rsource = 2000 Ohms and Rload = 3000 Ohms

15. Use circuit from problem 10. Common-base connection with Rsource = 40 Ohms and Rload = 10 K.