

1. (a) Explain why an electric field must exist in a graded semiconductor.
 (b) What is meant by the minority-carrier storage time of a diode?
 (c) Is $|V_{BE(sat)}|$ greater or less than $|V_{CE(sat)}|$ in a silicon transistor? Explain.
 (d) How is an aluminum contact made with n-type silicon so that it is ohmic? Explain.
2. (a) Draw a positive NOR DCTL circuit with a fan-in of 3 and a fan-out of 2. List the advantages of DCTL gates.
 (b) Write the decimal number 264 in the natural BCD system. Compare the resolution of this BCD code with that of a straight binary code having same bits.
 (c) Draw the block diagram of a four stage ripple counter. By what number N does this system divide?
 (d) Draw the circuit of a MOS NOT circuit with a depletion load. Sketch the transfer characteristic if the load FET has a much higher resistance.
3. (a) Sketch the circuit of a 6-MOSFET static RAM cell, and explain its operation briefly.
 (b) Explain how to obtain lead compensation in an inverting OP AMP.
 (c) Sketch an inverting Schmitt trigger, and its transfer characteristic.
 (d) Define intermodulation distortion.
4. Assume $h_{fe} = 50$ and $h_{ie} = 1.1 \text{ k}\Omega$ for the amplifier shown in Fig. 1. Compute $A_I = I_o/I_i$, A_V , A_{VS} , and R_i . Neglect the reactance of C_b .

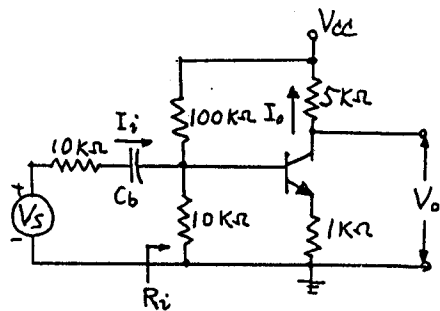


Fig. 1

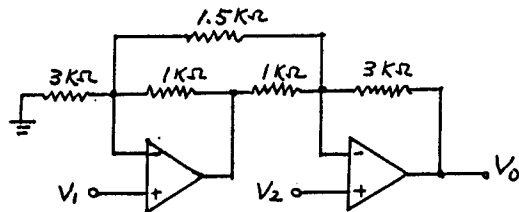


Fig. 2

5. For the amplifier shown in Fig. 2, calculate the voltage gain $A_d = V_o/(V_2 - V_1)$.