7. **The initial slope of a sine wave is directly proportional to**
   a. Slew rate
   b. Frequency
   c. Voltage gain
   d. Capacitance

8. **When the initial slope of a sine wave is greater than the slew rate,**
   a. Distortion occurs
   b. Linear operation occurs
   c. Voltage gain is maximum
   d. The op amp works best

9. **The power bandwidth increases when**
   a. Frequency decreases
   b. Peak value decreases
   c. Initial slope decreases
   d. Voltage gain increases

10. **A 741C contains**
    a. Discrete resistors
    b. Inductors
    c. Active-load resistors
    d. A large coupling capacitor

11. **A 741C cannot work without**
    a. Discrete resistors
    b. Passive loading
    c. DC return paths on the two bases
    d. A small coupling capacitor

12. **The input impedance of a BIFET op amp is**
    a. Low
    b. Medium
    c. High
    d. Extremely high

13. **An LF157A is a**
    a. Diff amp
    b. Source follower
    c. Bipolar op amp
    d. BIFET op amp

14. **If the two supply voltages are ±12 V, the MPP value of an op amp is closest to**
    a. 0 c. −12 V
    b. +12 V d. 24 V

15. **The open-loop cutoff frequency of a 741C is controlled by**
    a. A coupling capacitor
    b. The output short circuit current
    c. The power bandwidth
    d. A compensating capacitor

16. **The 741C has a unity-gain frequency of**
    a. 10 Hz c. 1 MHz
    b. 20 kHz d. 15 MHz

17. **The unity-gain frequency equals the product of closed-loop voltage gain and the**
    a. Compensating capacitance
    b. Tail current
    c. Closed-loop cutoff frequency
    d. Load resistance

18. **If f_{unity} is 10 MHz and midband open-loop voltage gain is 200,000, then the open-loop cutoff frequency of the op amp is**
    a. 10 Hz c. 50 Hz
    b. 20 Hz d. 100 Hz

19. **The initial slope of a sine wave increases when**
    a. Frequency decreases
    b. Peak value increases
    c. C_c increases
    d. Slew rate decreases

20. **If the frequency of the input signal is greater than the power bandwidth,**
    a. Slew-rate distortion occurs
    b. A normal output signal occurs
    c. Output offset voltage increases
    d. Distortion may occur

21. **An op amp has an open base resistor. The output voltage will be**
    a. Zero
    b. Slightly different from zero
    c. Maximum positive or negative
    d. An amplified sine wave

22. **An op amp has a voltage gain of 200,000. If the output voltage is 1 V, the input voltage is**
    a. 2 μV c. 10 mV
    b. 5 μV d. 1 V

23. **A 741C has supply voltages of ±15 V. If the load resistance is large, the MPP value is approximately**
    a. 0 c. 27 V
    b. +15 V d. 30 V

24. **Above the cutoff frequency, the voltage gain of a 741C decreases approximately**
    a. 10 dB per decade
    b. 20 dB per octave
    c. 10 dB per octave
    d. 20 dB per decade

25. **The voltage gain of an op amp is unity at the**
    a. Cutoff frequency
    b. Unity-gain frequency
    c. Generator frequency
    d. Power bandwidth

26. **When slew-rate distortion of a sine wave occurs, the output**
    a. Is larger
    b. Appears triangular
    c. Is normal
    d. Has no offset

27. **A 741C has**
    a. A voltage gain of 100,000
    b. An input impedance of 2 MΩ
    c. An output impedance of 75 Ω
    d. All of the above

28. **The closed-loop voltage gain of an inverting amplifier equals**
    a. The ratio of the input resistance to the feedback resistance
    b. The open-loop voltage gain
    c. The feedback resistance divided by the input resistance
    d. The input resistance

29. **The noninverting amplifier has a**
    a. Large closed-loop voltage gain
    b. Small open-loop voltage gain
    c. Large closed-loop input impedance
    d. Large closed-loop output impedance

30. **The voltage follower has a**
    a. Closed-loop voltage gain of unity
    b. Small open-loop voltage gain
    c. Closed-loop bandwidth of zero
    d. Large closed-loop output impedance

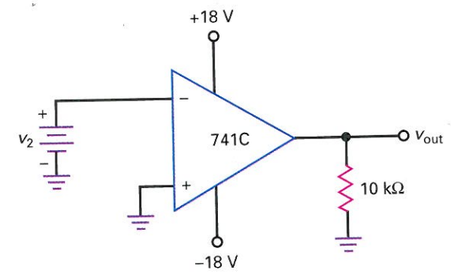
31. **A summing amplifier can have**
    a. No more than two input signals
    b. Two or more input signals
    c. A closed-loop input impedance of infinity
    d. A small open-loop voltage gain

Problems

SEC. 18-2 THE 741 OP AMP

18-1 Assume that negative saturation occurs at 1 V less than the supply voltage with an 741C. How much inverting input voltage does it take to drive the op amp of Fig. 18-29 into negative saturation?

Figure 18-29



18-2 What is the common-mode rejection ratio of an LF157A at low frequencies? Convert this decibel value to an ordinary number.

18-3 What is the open-loop voltage gain of an LF157A when the input frequency is 1 kHz? 10 kHz? 100 kHz? (Assume a first-order response, that is, 20 dB per decade rolloff.)

18-4 The input voltage to an op amp is a large voltage step. The output is an exponential waveform that changes 2.0 V in 0.4 μs. What is the slew rate of the op amp?

18-5 An LM318 has a slew rate of 70 V/μs. What is the power bandwidth for a peak output voltage of 7 V?

18-6 Use Eq. (18-2) to calculate the power bandwidth for each of the following:
   a. $S_R = 0.5$ V/μs and $V_p = 1$ V
   b. $S_R = 3$ V/μs and $V_p = 5$ V
   c. $S_R = 15$ V/μs and $V_p = 10$ V

SEC. 18-3 THE INVERTING AMPLIFIER

18-7 MultiSim What are closed-loop voltage gain and bandwidth in Fig. 18-30? What is the output voltage at 1 kHz? At 10 MHz? Draw the ideal Bode plot of closed-loop voltage gain.

Figure 18-30

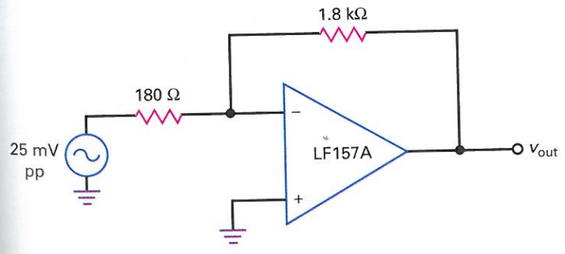
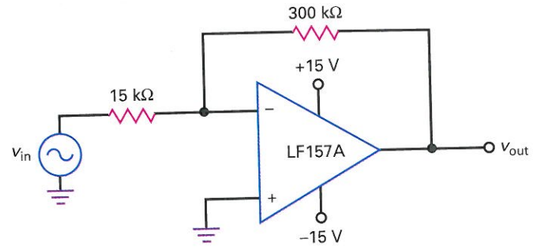


Figure 18-31



18-8 What is the output voltage in Fig. 18-31 when V_{in} is zero? Use the typical values of Table 18-1.

18-9 The data sheet of an LF157A lists the following worst-case parameters: $I_{in(bias)} = 50$ pA, $I_{in(off)} = 10$ pA, and $V_{in(off)} = 2$ mV. Recalculate the output voltage when V_{in} is zero in Fig. 18-31.

SEC. 18-4 THE NONINVERTING AMPLIFIER

18-10 MultiSim In Fig. 18-32, what are the closed-loop voltage gain and bandwidth? The ac output voltage at 100 kHz?

18-11 What is the output voltage when V_{in} is reduced to zero in Fig. 18-32? Use the worst-case parameters given in Prob. 18-9.

Figure 18-32