Course: MS 101

EE Lectures 6 and 7 : Op Amp Circuits

Sample Questions – Set 1 (April 2, 2023)

1. (A) A signal is a deterministic waveform. [T/F]
   (B) Distortion is a disturbance related to the signal. [T/F]
   (C) Noise is always a random waveform. [T/F]
   (D) Total number of conductors needed for 6 differential signals is ___.
   (E) Total number of conductors needed for 8 single-ended signals is ___.

2. A signal with source resistance R_S is connected to load resistance R_L. For representing this signal, the Thevenin representation (voltage with a series resistance) is preferred if $R_S >> R_L$. [T/F]

3. (A) The two supply voltages in a dual-supply amplifier have to be equal. [T/F]
   (B) For an ideal current amplifier, input resistance R_i is ___ and output resistance R_o is ___.

4. The key features of an op amp are:
   (A) direct-coupled (dc) high-gain voltage amplifier,
   (B) differential input and differential output,
   (C) very high voltage gain,
   (D) very high input resistance
   (E) very low output resistance.

5. (A) The circuit ground of an op amp is connected through the supply. [T/F]
   (B) Minimum number of pins needed for six op amps on a single IC is ___.

6. (A) In an ideal op amp, there is no effect of the voltage common to the two input terminals, i.e. (v2 + v1)/2, on the output. It is known as 'virtual short'. [T/F].

7. An ideal op amp has finite output voltage with zero differential voltage because it has
   (A) infinite differential voltage gain.
   (B) infinite input resistances for the two inputs.
   (C) infinite common-mode rejection ratio.
   (D) dual supply voltages.

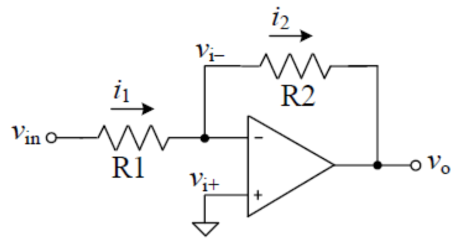
8. The circuit in the figure has a load resistance R_L (not shown in the figure) connected between the amplifier output and ground, and the output current i_o flows into this load. R_1 = 10 kΩ, R_2 = 100 kΩ. R_L = 500 Ω.

(A) For v_{in} = 100 mV, i_2 = ___ mA.

(B) For v_{in} = −100 mV, v_o = ___ mV.

(C) Current gain A_i = ___.

(D) Power gain A_p = ___.



(Q.8)

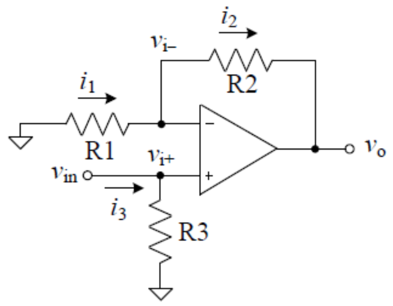
9. The circuit in the figure has a load resistance R_L (not shown in the figure) connected between the amplifier output and ground, and the output current i_o flows into this load. R_1 = 10 kΩ, R_2 = 100 kΩ. R_3 = 1 MΩ. R_L = 500 Ω.

(A) For v_{in} = 100 mV, i_2 = ___ mA.

(B) For v_{in} = −100 mV, v_o = ___ mV.

(C) Current gain A_i = ___.

(D) Power gain A_p = ___.



(Q.9)

10. In the circuit of Q.9, $R_1 = \infty$, R_2 = 0, R_3 = 1 MΩ, R_L = 500 Ω.

(A) For v_{in} = 100 mV, i_2 = ___ mA.

(B) For v_{in} = −100 mV, v_o = ___ mV.

(C) Current gain A_i = ___.

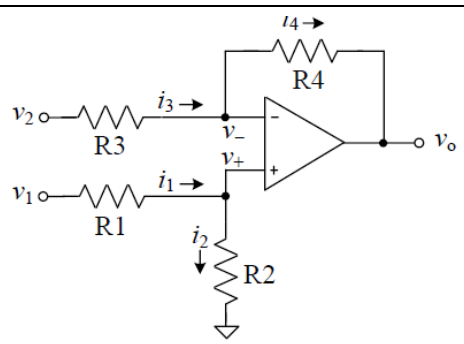
(D) Power gain A_p = ___.

11. The circuit in the figure has a load resistance R_L (not shown in the figure) connected between the amplifier output and ground, and the output current i_o flows into this load. $R_1 = R_3$ =10 kΩ, $R_2 = R_4$ = 100 kΩ, R_L = 500 Ω.

(A) R_{in1} = ___ kΩ, R_{in2} = ___ kΩ.

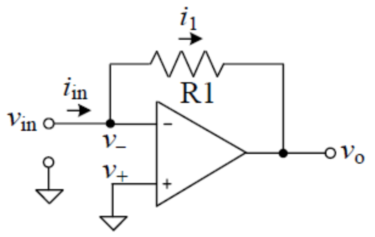
(B) For v_1 = 100 mV and v_2 = 100 mV, i_1 = ___ mA. i_3 = ___ mA, v_o = ___ mV, i_o = ___ mA.

(C)) For v_1 = 100 mV and v_2 = −100 mV, i_1 = ___ mA. i_3 = ___ mA, v_o = ___ mV, i_o = ___ mA.



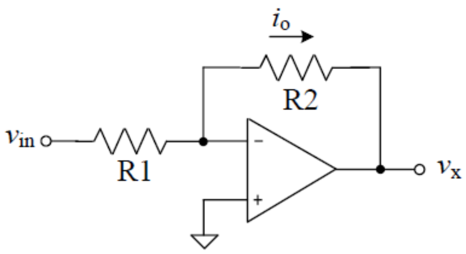
(Q.11)

12. The circuit in the figure has a load resistance R_L (not shown in the figure) connected between the amplifier output and ground, and the output current i_o flows into this load. $R_1 = R_L = 500\ \Omega$.
For this circuit,
(A) R_{in1} = ___ kΩ.
(B) For i_{in} = 1 mA, v_o = ___ V, i_o = ___ mA.



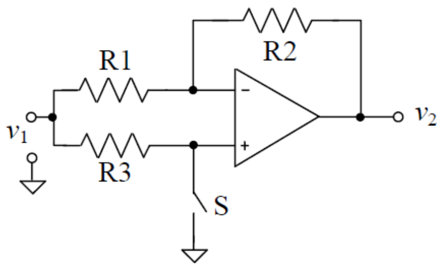
(Q.12)

13. The circuit in the figure has the output current i_o flowing in the load resistance R_2. $R_1 = 10$ kΩ. $R_2 = 1$ kΩ.
(A) R_{in1} = ___ kΩ.
(B) For v_{in} = 1 V, i_o = ___ mA, v_x = mV.



(Q.13)

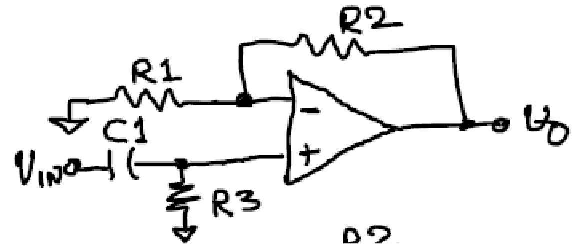
14. The circuit in the figure has $R_1 = 47$ kΩ. $R_2 = 47$ kΩ, $R_3 = 22$ kΩ.
(A) For S = closed and v_{in} = 1 V, v_o = ___V.
(B) For S = open and v_{in} = −1 V, v_o = ___V.



(Q.14)

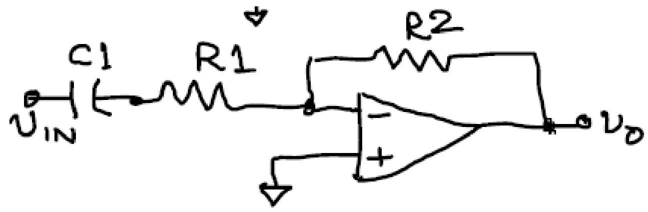
15. In a practical op amp,
(A) Input offset voltage may cause output saturation in high-gain direct-coupled circuits. [T/F]
(B) Typical value of input offset voltage: _____ mV.
(C) Input bias currents can reduce the common-mode rejection ratio. [T/F]
(D) Typical value of differential gain at dc: ___.

16. For the AC amplifier in the figure, C1 is selected for the voltage gain nearly constant above 100 Hz. R_1 = 10 kΩ, R_2 =100 kΩ, R_3 =1 MΩ,
(A) C_1 >> ___ nF.
(B) Voltage gain at dc = ___
(C) Voltage gain at high frequency = ___.
(D) Input resistance at high frequency = ___.
(E) For $v_{in} = 1 + 0.1 \cos(10^5 t)$ V, v_o = ___________________________________



(Q.16)

17. For the AC amplifier in the figure, C1 is selected for the voltage gain is nearly constant above 100 Hz. R_1 = 10 kΩ, R_2 =100 k.
(A) C_1 >> ___ nF.
(B) Voltage gain at dc = ___
(C) Voltage gain at high frequency = ___.
(D) Input resistance at high frequency = ___.
(E) For $v_{in} = 1 + 0.1 \cos(10^5 t)$ V, v_o = ___________________________________



(Q.17)