Q1:

C D C B D

Q2:

a) 1) An ideal operational amplifier has no current at its input. It amplifies the difference between two inputs, which have infinite input impedance and zero output impedance. And it has an infinite gain.

   2) Practical operational amplifiers: allow 1-2 pA input current, or R > 1TΩ; The harvest will not be infinite; The output impedance is not very low.

b) Practical operational amplifiers: allow 1-2 pA input current, or R > 1T ω; The harvest will not be infinite; The output impedance is not very low, the rotation rate is the fastest speed that the output can change, it determines the ability of the operational amplifier to restore signal details, the larger the parameter, the better the ability to restore signal details.

c) Open-loop gain does not have feedback from V-out, while Close-loop gain possess.

Q3:

Q3.

(1)

$$i_2 = \frac{V_+ - V^-}{R_1} \quad ①$$

$$i_2 = \frac{V^- - V_0}{R_2} \quad ②$$

$$V_0 = 3\,V$$

(2)

$$i_2 = \frac{V_1 - V_0}{R_1} \quad ①$$

$$i_L = \frac{V_0 - 0}{R_L} \quad ②$$

$$\therefore i_2 = -0.2\ mA$$

$$i_L = 0.75\ mA$$

and $i_0 = \cancel{0A}\ 0.95\ mA$

Q4

Q4. (i)

$$i_1 = \frac{V_{I1} - V_+}{R_1} \qquad i_2 = \frac{V_{I2} - V_+}{R_2}$$

$$\frac{V_+ - 0}{R_5} = i_1 + i_2 \quad ①$$

$$\frac{V_0 - V_-}{R_3} = i_0 \quad ②$$

$$V_- = V_+ \qquad \frac{V_-}{R_4} = i_0 \quad ③$$

$$\therefore V_0 = \frac{(V_{I1}R_2 + V_{I2}R_1)R_5}{R_1R_2 + R_2R_5 + R_1R_5}\left(\frac{R_3}{R_4} + 1\right).$$

$$\therefore \text{So} \quad V_0 = \frac{3}{14}(4V_{I1} + 2V_{I2})$$

Q5

Q5.

(1) $$A = \frac{-C_2 \| R_2}{R_1} = \frac{\frac{-R_2}{j\omega C}}{\frac{1}{j\omega C}+R} \times \frac{1}{R_1} \quad ①$$

$$= -\frac{R_2}{R_1} \cdot \frac{1}{j\omega R_c+1}$$

(2) $$A_0 = -\frac{R_2}{R_1} \quad ②$$

(3) So $$\frac{A_1}{A_0} = \frac{\sqrt{2}}{2}$$

$$f = \frac{1}{2\pi R_2 C_2}$$