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Negative Feedback Amplifiers Formulas

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List of 15 Negative Feedback Amplifiers Formulas

Negative Feedback Amplifiers

1) Amount of Feedback Given Loop Gain

Open Calculator

fx $$F_{am} = 1 + A\beta$$

ex $$3.6 = 1 + 2.6$$

2) Closed-Loop Gain as Function of Ideal Value

Open Calculator

fx $$A_{cl} = \left(\frac{1}{\beta}\right) \cdot \left(\frac{1}{1 + \left(\frac{1}{A\beta}\right)}\right)$$

ex $$1.590798 = \left(\frac{1}{0.454}\right) \cdot \left(\frac{1}{1 + \left(\frac{1}{2.6}\right)}\right)$$

3) Error Signal

Open Calculator

fx $$S_e = \frac{S_{so}}{1 + (A \cdot \beta)}$$

ex $$11.0066 = \frac{22}{1 + (2.2 \cdot 0.454)}$$

4) Feedback Factor of Feedback Amplifier

Open Calculator

fx $$\beta = \frac{S_{in}}{S_o}$$

ex $$0.454545 = \frac{16}{35.2}$$

5) Feedback Signal

Open Calculator

fx $$S_f = \left(\frac{A \cdot \beta}{1 + (A \cdot \beta)}\right) \cdot S_{so}$$

ex $$10.9934 = \left(\frac{2.2 \cdot 0.454}{1 + (2.2 \cdot 0.454)}\right) \cdot 22$$

6) Gain at Mid and High Frequencies

Open Calculator

fx $$\mu = \frac{A_m}{1 + \left(\frac{s}{\omega_{hf}}\right)}$$

ex $$19.61055 = \frac{20.9}{1 + \left(\frac{2\text{Hz}}{30.417\text{Hz}}\right)}$$

7) Gain with Feedback of Feedback Amplifier

Open Calculator

fx $$A_f = \frac{A}{F_{am}}$$

ex $$0.611111 = \frac{2.2}{3.6}$$

8) Input Resistance with Feedback Current Amplifier

Open Calculator

fx $$R_{inf} = \frac{R_{in}}{1 + A\beta}$$

ex $$6.944444\text{k}\Omega = \frac{25\text{k}\Omega}{1 + 2.6}$$

9) Lower 3-DB Frequency in Bandwidth Extension

Open Calculator

fx $$\omega_{Lf} = \frac{f_{3dB}}{1 + (A_m \cdot \beta)}$$

ex $$0.276491\text{Hz} = \frac{2.9\text{Hz}}{1 + (20.9 \cdot 0.454)}$$

10) Output Current of Feedback Voltage Amplifier Given Loop Gain

Open Calculator

fx $$i_o = (1 + A\beta) \cdot \frac{V_o}{R_o}$$

ex $$19.3133\text{mA} = (1 + 2.6) \cdot \frac{12.5\text{V}}{2.33\text{k}\Omega}$$

11) Output Resistance with Feedback Current Amplifier

Open Calculator

fx $$R_{cof} = F_{am} \cdot R_o$$

ex $$8.388\text{k}\Omega = 3.6 \cdot 2.33\text{k}\Omega$$

12) Output Resistance with Feedback Voltage Amplifier

Open Calculator

fx $$R_{vof} = \frac{R_o}{1 + A\beta}$$

ex $$0.647222\text{k}\Omega = \frac{2.33\text{k}\Omega}{1 + 2.6}$$

13) Output Signal in Feedback Amplifier

Open Calculator

fx $$S_o = A \cdot S_{in}$$

ex $$35.2 = 2.2 \cdot 16$$

14) Signal-to-Interference Ratio at Output

Open Calculator

fx $$S_{ir} = \left(\frac{V_s}{V_n}\right) \cdot \mu$$

ex $$67.85467 = \left(\frac{9\text{V}}{2.601\text{V}}\right) \cdot 19.61$$

15) Upper 3-DB Frequency of Feedback Amplifier

Open Calculator

fx $$\omega_{hf} = f_{3dB} \cdot (1 + A_m \cdot \beta)$$

ex $$30.41694\text{Hz} = 2.9\text{Hz} \cdot (1 + 20.9 \cdot 0.454)$$

Variables Used

- **μ** Gain Factor
- **A** Open Loop Gain of an Operational Amplifier
- A_{cl} Closed-Loop Gain
- A_f Gain with Feedback
- A_m Mid Band Gain
- **Aβ** Loop Gain
- f_{3dB} 3-dB Frequency *(Hertz)*
- F_{am} Amount of Feedback
- i_o Output Current *(Milliampere)*
- R_{cof} Output Resistance of Current Amplifier *(Kilohm)*
- R_{in} Input Resistance *(Kilohm)*
- R_{inf} Input Resistance with Feedback *(Kilohm)*
- R_o Output Resistance *(Kilohm)*
- R_{vof} Output Resistance of Voltage Amplifier *(Kilohm)*
- **s** Complex Frequency Variable *(Hertz)*
- S_e Error Signal
- S_f Feedback Signal
- S_{in} Input Signal Feedback
- S_{ir} Signal to Interference Ratio
- S_o Signal Output
- S_{so} Source Signal

- V_n Voltage Interference *(Volt)*
- V_o Output Voltage *(Volt)*
- V_s Source Voltage *(Volt)*
- β Feedback Factor
- ω_{hf} Upper 3-dB Frequency *(Hertz)*
- ω_{Lf} Lower 3-dB Frequency *(Hertz)*

Constants, Functions, Measurements used

- Measurement: **Electric Current** in Milliampere (mA)
  Electric Current Unit Conversion
- Measurement: **Frequency** in Hertz (Hz)
  Frequency Unit Conversion
- Measurement: **Electric Resistance** in Kilohm (kΩ)
  Electric Resistance Unit Conversion
- Measurement: **Electric Potential** in Volt (V)
  Electric Potential Unit Conversion

Check other formula lists

- **Negative Feedback Amplifiers Formulas**

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