

Important Negative Feedback Amplifiers Formulas PDF



Formulas Examples with Units

List of 15 Important Negative Feedback Amplifiers Formulas

1) Amount of Feedback Given Loop Gain Formula ↻

Formula

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

Example

$$3.6 = 1 + 2.6$$

Evaluate Formula ↻

2) Closed-Loop Gain as Function of Ideal Value Formula ↻

Formula

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

Example

$$1.5908 = \left(\frac{1}{0.454} \right) \cdot \left(\frac{1}{1 + \left(\frac{1}{2.6} \right)} \right)$$

Evaluate Formula ↻

3) Error Signal Formula ↻

Formula

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

Example

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

Evaluate Formula ↻

4) Feedback Factor of Feedback Amplifier Formula ↻

Formula

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

Example

$$0.4545 = \frac{16}{35.2}$$

Evaluate Formula ↻

5) Feedback Signal Formula ↻

Formula

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

Example

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

Evaluate Formula ↻



6) Gain at Mid and High Frequencies Formula

Formula

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

Example with Units

$$19.6106 = \frac{20.9}{1 + \left(\frac{2 \text{ Hz}}{30.417 \text{ Hz}} \right)}$$

Evaluate Formula 

7) Gain with Feedback of Feedback Amplifier Formula

Formula

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

Example

$$0.6111 = \frac{2.2}{3.6}$$

Evaluate Formula 

8) Input Resistance with Feedback Current Amplifier Formula

Formula

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

Example with Units

$$6.9444 \text{ k}\Omega = \frac{25 \text{ k}\Omega}{1 + 2.6}$$

Evaluate Formula 

9) Lower 3-DB Frequency in Bandwidth Extension Formula

Formula

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

Example with Units

$$0.2765 \text{ Hz} = \frac{2.9 \text{ Hz}}{1 + (20.9 \cdot 0.454)}$$

Evaluate Formula 

10) Output Current of Feedback Voltage Amplifier Given Loop Gain Formula

Formula

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

Example with Units

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

Evaluate Formula 

11) Output Resistance with Feedback Current Amplifier Formula

Formula

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

Example with Units

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

Evaluate Formula 

12) Output Resistance with Feedback Voltage Amplifier Formula

Formula

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

Example with Units

$$0.6472 \text{ k}\Omega = \frac{2.33 \text{ k}\Omega}{1 + 2.6}$$

Evaluate Formula 

13) Output Signal in Feedback Amplifier Formula

Formula

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

Example

$$35.2 = 2.2 \cdot 16$$

Evaluate Formula 



14) Signal-to-Interference Ratio at Output Formula

Formula

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

Example with Units

$$67.8547 = \left(\frac{9_v}{2.601_v} \right) \cdot 19.61$$

Evaluate Formula 

15) Upper 3-DB Frequency of Feedback Amplifier Formula

Formula

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

Example with Units

$$30.4169_{Hz} = 2.9_{Hz} \cdot \left(1 + 20.9 \cdot 0.454 \right)$$

Evaluate Formula 



Variables used in list of Negative Feedback Amplifiers Formulas above

- 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
- $A\beta$ 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 in list of Negative Feedback Amplifiers Formulas above

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



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