Transistor Amplifier Terminologies

Amplifier Terminologies

Gain of the Amplifier

- The ratio of the output quantity to the input quantity of the amplifier is called as Gain of the Amplifier.

Gain of Multistage Amplifier

- Let us consider three amplifiers having respective gain of G1, G2 and G3.

  The total gain of the amplifier is

  G = G1 × G2 × G3

- The gain of the multistage amplifier G is less than produce of G1 × G2 × G3

  due to loading of next stages.

Decibel Gain

● The gain of the amplifier is very large therefore it is represented by common

   logarithm (base 10). The unit of gain is bel or db.

Power gain

● The ratio of output power to the input power in log to the base 10 is called as

   power gain of the amplifier.

● Power Gain = Log_{10} (P_{OUT} / P_{IN}) bel

1 bel = 10 db = 10 $\log_{10}$ (P_{OUT} / P_{IN}) db

1 bel = 10 db

Voltage Gain

- The ratio of the output voltage to the input voltage in log of base 10 is called

  as voltage gain of the amplifier.

- Let $P_{OUT} = V_{OUT}^2 / R$

- $P_{IN} = V_{IN}^2 / R$

Voltage gain = 10 $\log_{10}$ (P_{OUT} / P_{IN}) db

= 10 $\log_{10}$ [V_{OUT}^2 / R] / [V_{IN}^2 / R] db

= 20 $\log_{10}$ (V_{OUT} / V_{IN}) db

Current Gain

● The ratio of the output current to the input current in log of base 10 is called

as voltage gain of the amplifier.

Let $P_{OUT} = I_{OUT}^2 R$

$P_{IN} = I_{IN}^2 R$

● Current Gain = $10 \, Log_{10} \, (\, P_{OUT} \, / \, P_{IN} \,)$ db

$= 10 \, Log_{10} \, [\, I_{OUT}^2 R \,] \, / \, [\, I_{IN}^2 R \,]$ db

$= 20 \, Log_{10} \, (\, I_{OUT} \, / \, I_{IN} \,)$

Power Gain	$Log_{10} (P_{OUT} / P_{IN})$ bel	$10 Log_{10} (P_{OUT} / P_{IN})$ db
Current Gain	$Log_{10} (I_{OUT} / I_{IN})$ bel	$20 Log_{10} (I_{OUT} / I_{IN})$ db
Voltage Gain	$Log_{10} (V_{OUT} / V_{IN})$ bel	$20 Log_{10} (V_{OUT} / V_{IN})$ db

Bandwidth

- *It is range of frequencies over which the voltage gain is equal to or greater than 70.7% of the maximum gain.*

- The f1 and f2 is range of frequencies over which the gain is equal / greater than 70.7% of the maximum gain.

  Where f1 = Lower cut off frequency and f2 = Higher cut off frequency
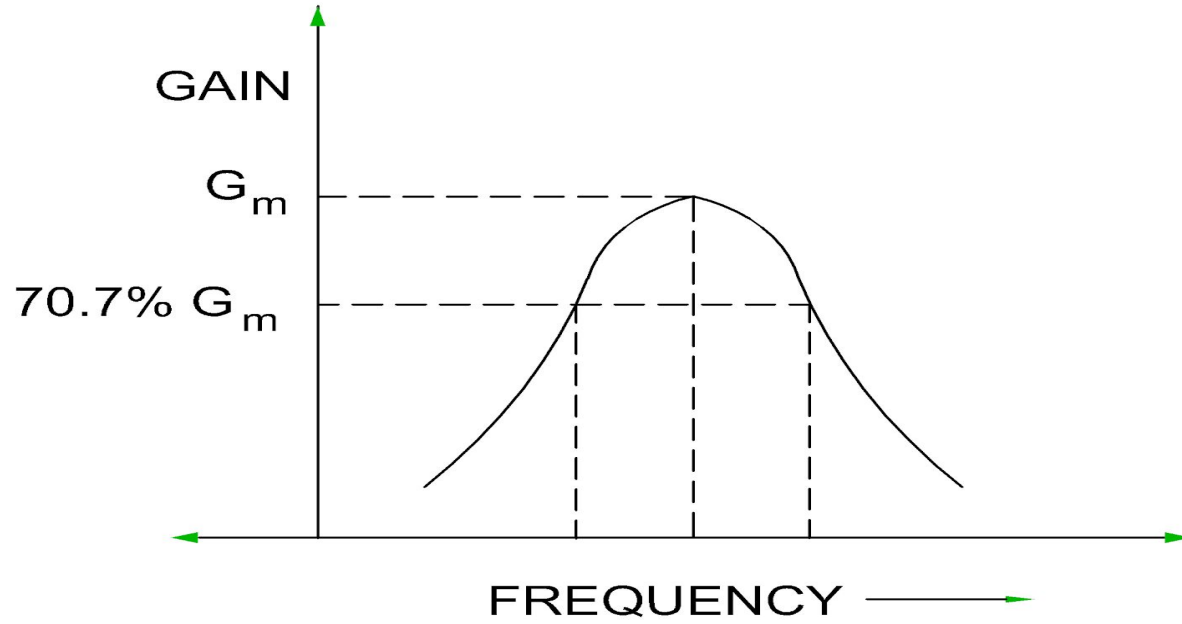
  Bandwidth = f2 – f1

FIG : EFFECT OF FREQUENCY ON GAIN

- It is important that the signal frequencies lie between f1 and f2 for distortion less amplification.

Bandwidth in terms of db

Let us consider that the maximum gain of the amplifier is 100.

Fall in voltage gain from 100 to 70.7%

$= 20 \, Log_{10} \, (\, 100 \,) - 20 \, Log_{10} \, (\, 70.7 \,)$ db

$= 20 \, Log_{10} \, (\, 100 \, / \, 70.7 \,)$ db

$= 20 \, Log_{10} \, (\, 1.414 \,)$ db $= 3$db

- ***The bandwidth of the amplifier is defined as the range of frequency over which the voltage gain fall by 3 db from the maximum gain.***

- The frequency f1 or f2 is called as half power frequency or 3 db frequency.

Thank You
www.myelectrical2015.com