**NAME: Ngofa Amejimaobari**

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**DEPARTMENT : COMPUTER ENGINEERING**

**A.**

A circuit designed to perform this frequency selection is called a filter circuit, or simply a filter. A common need for filter circuits is in high-performance stereo systems, where certain ranges of audio frequencies need to be amplified or suppressed for best sound quality and power efficiency.

Audio equalizers and crossover networks are two well-known applications of filter circuits.

A Bode plot is a graph plotting waveform amplitude or phase on one axis and frequency on the other.

Electronic filters remove unwanted frequency components from the applied signal, enhance wanted ones, or both. They can be:

passive or active

analog or digital

high-pass, low-pass, band-pass, band-stop (band-rejection; notch), or all-pass.

discrete-time (sampled) or continuous-time

linear or non-linear

infinite impulse response (IIR type) or finite impulse response (FIR type)

1. **Designing a Low-Pass Filter with 0.005Ω resistor and 0.01F capacitor**

**A 100V Amplitude was selected with a frequency of 1Hz for the Sine Wave Source.**



**C. Determining the Cut-off frequency**

The cut-off frequency is calculated by F= ½\*(pi\*R\*C)

When R= 0.005Ω and C= 0.01F

F= 0.5\*pi\*0.005\*0.01=3189.099 Hz

**D. Design Output**

The transfer function equation for the circuit is given as (1/RC)/(S + 1/RC)

When R= 0.005Ω and C= 0.01F

Transfer Fcn=(1/0.005\*0.01)/(S + (0.005\*0.01))= (20000)/(s+ 20000)



1. **If two signals of 5 KΩ and 2 KΩ are pass through the filter at different intervals. Discuss your observation**

**When the signal of 5 KΩ is passed through the filter, the following result is obtained:**

The transfer function equation for the circuit is given as (1/RC)/(S + 1/RC)

When R= 5000Ω and C= 0.01F

Transfer Fcn=(1/5000\*0.01)/(S + (5000\*0.01))= (0.02)/(s+ 0.02)



**Observations:** The signal is attenuated to 3.869 ohms

**When the signal of 2K ohms is passed through the filter the following results are obtained:** The transfer function equation for the circuit is given as

(1/RC)/(S + 1/RC)

When R= 2000Ω and C= 0.01F

Transfer Fcn=(1/2000\*0.01)/(S + (2000\*0.01))= (0.05)/(s+ 0.05)



**Observations:** The signal is attenuated to 9.266 ohms