Experiment No.:

Subject: Network Theory LAB.

Title – To study high pass and low pass filter.

Year: 2nd Year

Roll No.: 31

Div.: ELX-A

Date:

**High Pass and Low Pass Filter**

**Aim: To study high pass and low pass filter.**

**Apparatus**: Circuit board, A.F signal generator, A.C source, mili-voltmeter, etc.

**Low Pass Filter**

**Theory:** Filter is a network which ideally passes at least one range of frequency without any attenuation and all other frequencies are totally attended. The frequency range in which attenuation is absent is called as ‘Pass Band’, while other frequency range from ‘Stop Band’, frequencies which separates two bands are called cut of frequencies. Low pass filter transmits all frequencies from 0 up to some particular frequency called fc and offers great attenuation to all other higher frequencies. At low frequency, inductance in series arm has low impedance and capacitance in shunt arm has high impedance so very low amount of signal current is passed through capacitor arm and more current is passed through inductance as well as through load resistance, so at low frequency, voltage drop across load resistance is large. As the frequency of input signal increased, the impedance of inductor in series arm is increased and impedance of capacitor in shunt arm start decreasing. So signal current in capacitor branch increases and effective current passing through inductor decreases as load current decreases.

**Procedure:**

1. Make all connections as given figure.
2. Apply input 1~2v rms and keep it constant.
3. Vary frequency from 100Hz to 20 KHz in suitable step and down output corresponding to voltage Vo.
4. Plot the graph of frequency via output voltage on graph paper.
5. Determine cutoff frequency from graph.
6. Compare practical and theoretical results.

**Formula:**

Low Pass Filter: *f*c = , *C* = , *L* = where, *f*c = cutoff frequency, RL = R.

**Diagram**:

**Observation Table:**

|  |  |  |
| --- | --- | --- |
| *fc* | VO | gain |
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**Calculation:**

**High Pass Filter**

**Theory:** High Pass filter transmits frequencies below cutoff frequency. S shown in the figure at low frequencies, impedance of capacitor in series arm is very high. Impedance of inductance in stunt arm is very less. Large amount of signal current is bypassed to inductance while current passing through capacitor thus through RL is less. As the frequency is increased, impedance of the capacitor in series arm starts decreasing while inductance in shunt arm starts increasing. Effect of this current bypassing through inductance starts reducing and current passing through capacitor increases. So, current through RL also increases. Hence, voltage drop across RL increases.

**Procedure:**

1. Make all connections as given figure.
2. Apply input 1~2v rms and keep it constant.
3. Vary frequency from 100Hz to 20 KHz in suitable step and down output corresponding to voltage Vo.
4. Plot the graph of frequency via output voltage on graph paper.
5. Determine cutoff frequency from graph.
6. Compare practical and theoretical results.

**Formula:**

High Pass Filter: *f*c = , *C* = , *L* = where, *f*c = cutoff frequency, RL = R.

**Diagram:**

**Observation Table:**

|  |  |  |
| --- | --- | --- |
| *f*c(Hz) | VO | gain |
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**Calculation:**

**Result:**

|  |  |  |
| --- | --- | --- |
| Cutoff frequency | LPF | HPF |
| Calculation |  |  |
| From graph |  |  |