

Faculty of Engineering and Technology

Electrical and Computer Engineering Department

Circuits LAB (ENEE2102)

Pre-LAB of Experiment #9

Passive Filters Analysis

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# Pre-Lab:

## First-order RC High Pass Filter:



Fig (9.1): First-order RC High Pass Filter

|  |  |  |
| --- | --- | --- |
| The cut-off frequency = | wc = $\frac{1}{CR}$fc = $\frac{1}{2πCR}$ = 1591.54 Hz | (1)(2) |



Fig(9.2): Vo(db)



Fig(9.3): p(Vo)

## First-order RC Loaded Low Pass Filter:

##

Fig (9.4): First-order RC loaded Low pass filter

|  |  |  |
| --- | --- | --- |
| The cut-off frequency = | wc = $\frac{1}{C(R||Rl)}$fc = $\frac{1}{2πC(R||Rl)}$ = $\frac{1}{2π\*0.1u\*500}=3183.098Hz$ | (3)(4) |



Fig (9.5): Vo(db)



Fig (9.6): p(Vo)

## Parallel RLC Band Pass Filter:



Fig (9.7): Parallel RLC Band Pass Filter

* R = 3.2KΩ

|  |  |  |
| --- | --- | --- |
| The Center Frequency = | Wo = $\frac{1}{\sqrt{LC}}$ = 9407.2 rad/sFo = $\frac{wo}{2π}$ = 1497.2 Hz | (5)(6) |
| The cut-off Frequency = | W2,1 = $\sqrt{(\frac{1}{2RC})^{2}+\frac{1}{LC}}\pm \frac{1}{2RC}$ W2 = 11098.588 rad/sW1 = 7973.588 rad/sFc.2 = $\frac{W2}{2π}$ = 1766.39 HzFc1 = $\frac{W1}{2π}$ = 1269.036 Hz | (7)(8)(9) |
| Bandwidth =  | β = w2 – w1 = 3125 rad/sβ = $\frac{1}{RC}=3125$ rad/sβ = 497.36 Hz | (10)(11) |

* R = 1.6KΩ

|  |  |  |
| --- | --- | --- |
| The Center Frequency = | Wo = $\frac{1}{\sqrt{LC}}$ = 9407.2 rad/sFo = $\frac{wo}{2π}$ = 1497.2 Hz | (12)(13) |
| The cut-off Frequency = | W2,1 = $\sqrt{(\frac{1}{2RC})^{2}+\frac{1}{LC}}\pm \frac{1}{2RC}$ W2 = 13042.92 rad/sW1 = 6792.92 rad/sFc.2 = $\frac{W2}{2π}$ = 4959.065 HzFc1 = $\frac{W1}{2π}$ = 789.259 Hz | (14)(15)(16) |
| Bandwidth =  | β = w2 – w1 = 6250 rad/sβ = $\frac{1}{RC}=6250$ rad/sβ = 994.72 Hz | (17)(18) |

Note: The simulation results were taken while the resistor = 3.2kΩ

##

Fig (9.8): Vo(db)



Fig (9.9): p(Vo)

## Series RLC Band Reject Filter



Fig (9.10): Series RLC Band Reject Filter

* R = 3.5KΩ

|  |  |  |
| --- | --- | --- |
| The Center Frequency = | Wo = $\frac{1}{\sqrt{LC}}$ = 9407.208 rad/sFo = $\frac{wo}{2π}$ = 1497.203 Hz | (19)(20) |
| The cut-off Frequency = | W2,1 = $\sqrt{(\frac{R}{2L})^{2}+\frac{1}{LC}}\pm \frac{R}{2L}$ W2 = 11082.5 rad/sW1 = 7985.16 rad/sFc.2 = $\frac{W2}{2π}$ = 1763.83 HzFc1 = $\frac{W1}{2π}$ = 1270.88 Hz | (21)(22)(23) |
| Bandwidth =  | β = w1 – w2 = 3097.34 rad/sβ = $\frac{R}{L}=$3097.34 rad/sβ = 492.95 Hz | (24)(25) |

* R = 7.1KΩ

|  |  |  |
| --- | --- | --- |
| The Center Frequency = | Wo = $\frac{1}{\sqrt{LC}}$ = 9407.208 rad/sFo = $\frac{wo}{2π}$ = 1497.203 Hz | (26)(27) |
| The cut-off Frequency = | W2,1 = $\sqrt{(\frac{R}{2L})^{2}+\frac{1}{LC}}\pm \frac{R}{2L}$ W2 = 13059.51 rad/sW1 = 6776.33 rad/sFc.2 = $\frac{W2}{2π}$ =2078.48 HzFc1 = $\frac{W1}{2π}$ =1078.49 Hz | (28)(29)(30) |
| Bandwidth =  | β = w1 – w2 = 6283.18 rad/sβ = $\frac{R}{L}=$6283.18 rad/sβ = 999.9 Hz | (31)(32) |

Note: The simulation results were taken while the resistor = 3.5kΩ



Fig (9.11): Vo(db)



Fig (9.9): p(Vo)