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#Diego Butler



so many fake sites. this is the first one which worked! Many thanks

Schaumann: Design of Analog Filters
Chapter 1: Introduction

Introduction 1-1

1.1 The gain $G = 20 \log_{10}(V_2) = 20 \log_{10}(3.3) = 14.55$ dB
Phase shift $\Delta \phi = \theta_2 - \theta_1 = 180^\circ - 125.7^\circ$

1.2 At 12 kHz, the gain of the filter is $G = 10^{0.99} = 1.239 \times 10^4$
 \Rightarrow The magnitude of output signal is $V_2 = G \cdot V_1 = 1.239 \times 10^4 \times 125.9 \mu\text{V}$

1.3 $\sigma = 20 \log_{10}(10^{-3}) - 20 \log_{10}(10^{-6}) = -60$ dB

1.4 The gain is $G = 10^{0.99} \cdot 42 = 56.25 \cdot 42 = 2363.1$
 $V_2 = G \cdot V_1 = 2363.1 \cdot 0.02 = 47.26$ V

1.5 (a) Lowpass. Transition bandwidth $\text{BW}_T = 9.8 - 3.4 = 6.4$ kHz
(b) Bandpass. Transition bandwidth $\text{BW}_T = 12.5 - 7 = 5.5$ kHz; $\text{BW}_{3\text{dB}} = 40 - 24 = 16$ kHz
(c) Bandstop. Transition bandwidth $\text{BW}_T = 12.5 - 7 = 5.5$ kHz; $\text{BW}_{3\text{dB}} = 40 - 24 = 16$ kHz
(d) Highpass. Transition bandwidth $\text{BW}_T = 40 - 24 = 16$ kHz
(e) Lowpass. Transition bandwidth $\text{BW}_T = 400 - 300 = 100$ kHz
(f) Bandpass. Transition bandwidth $\text{BW}_T = 1000 - 700 = 300$ kHz
 $\text{BW}_{3\text{dB}} = 7.8 - 2.4 = 5.4$ MHz

1.6 At $\omega_c = 0$, hence the gain is $20 \log_{10}(1) = 20 \log_{10}(0.32) = -20 \log_{10}(3.125) = -25.41$ dB
At high frequencies $\left| \frac{V_2}{V_1} \right| = \omega^2$, attenuation $a(\omega) = 20 \log_{10}(\omega^2) = 40 \log_{10}(\omega)$ increases 40 dB per decade.
When $\omega = \infty$ (infinity), attenuation is infinite.

1.7 In this problem's solution, denormalized component values are denoted by "n".
Denormalized parameters are $R_n = R_n$, $L_n = \frac{L_n}{\omega_c}$, and $C_n = C_n(\omega_c R_n)$, therefore $R_n = 300$ Ω , $L_n = 5.547 \mu\text{H}$, $C_n = 4.385 \mu\text{F}$, $L_n = 3.875 \mu\text{H}$, $C_n = 126.0 \mu\text{F}$, $C_n = 77.44 \mu\text{F}$

1.8 In this problem's solution, denormalized component values are denoted by "n". Since denormalized capacitance is $C_n = C_n(\omega_c R_n)$, where R_n is the normalization resistor, we have
 $R_n = \frac{1}{\omega_c C_n} = \frac{1}{2\pi \times 300 \times 10^3 \times 0.05 \times 10^{-6}} = 8.764$ k Ω
normalize the denormalized resistors and
 $R_n = R_n = 1.243 \times 8.764 \times 10^3 = 10.888$ k Ω
 $R_n = R_n = 1.677 \times 8.764 \times 10^3 = 14.683$ k Ω
 $R_n = R_n = 8.888 \times 8.764 \times 10^3 = 77.844$ k Ω

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