Filter design (Important questions)

1. Design a Chebyshev lowpass filter for the following specifications:
2. Stopband: at *fs*= 1.07 MHz (b) Passband: and *fc* = 500 kHz. Use Sallen-Key sections and first order sections as needed to realize the filter.
3. Design a high pass filter with a cut-off frequency of 42 kHz and a quality factor Q to obtain some of band-edge peaking above the high frequency level. The gain at high frequencies is to be 6 . The circuit should use LM741 opamps and operate at least 200 kHz before high frequency roll-off becomes noticeable.
4. A maximally flat magnitude transfer function is characterized by and n = 5. The frequency is normalized to the passband corner. Determine the lowest frequency at which is encountered.
5. In transfer function

T(s) = Determine the conditions , must satisfy so that T(s) is a (a) lowpass, (b) highpass, (c) bandpass, (d) allpass, (e) bandrejection function, (f) magnitude equalizer that provides.

1. Derive the output impedance of the non-inverting opamp for (a) Finite gain (b) Infinite gain.
2. Derive the input impedance of the inverting opamp for (a) Finite gain (b) Infinite gain.
3. Discuss and derive the opamp models,
4. One pole Model
5. Integrator Model.
6. Build a circuit that adds the signal v1(t) = 3 cos(1.6 × 106)t multiplied by 1.9 and the signal v2(t) = -2 ė-5t multiplied by K2 = 2 to the dc voltage V3 = 4.5. All voltages are measured in volts [V] and the frequency is in rad/s. Will an LM741 opamp be adequate for the task? Assume ft = 1.5 MHz.
7. What is the value of Chebyshev polynomial of degree 3?
8. What is the formula for chebyshev polynomial TN(x) in recursive form?
9. At which frequency does the magnitude of the system becomes zero dB?
10. Which unit is adopted for magnitude measurement in Bode plots?
11. Which filter has a maximally flat response between Bessel, Butterworth and Chebyshev?
12. Define first order filter of bilinear transfer function.
13. Create a bode plot for the bilinear transfer function
14. Describe types of filters with suitable diagram.
15. What are the advantages of Analog filters over digital filters?
16. Define insertion gain, insertion loss, attenuation and unit of gain.
17. The input voltage of a filter is V1(t) = and its output voltage is V2(t) = . At the applied frequency w, determine the gain in dB and the phase shift in degrees implemented by the filter.
18. Identify the filter type (lowpass, bandpass, etc.) describe by the following attenuation specification and calculate the widths of the transition of the bands.
19. αmax = 0.01 dB in f ≤ 3.4 kHz; αmin = 45 dB in 9.6 kHz ≤ f ≤ ∞.
20. αmax = 0.01 dB in 12.5 kHz ≤ f ≤ 24 kHz; αmin = 45 dB in f ≤ 7 kHz and f ≥ 40 kHz.
21. αmax = 85 dB in 12.5 kHz ≤ f ≤ 24 kHz; αmin = 1 dB in f ≤ 7 kHz and f ≥ 40 kHz.
22. αmax = 3 dB in 1 MHz ≤ f ≤ 2.4 MHz; αmin = 75 dB in f ≤ 730 kHz and αmin = 48 dB in f ≥ 7.8 MHz.
23. Compute magnitude, phase, pole and zero of T(s). Assume and . Where . Also plot magnitude and phase and identify the type of filter.
24. Use the procedure to find the output voltage V0 of the circuit in fig. 3.



1. The opamp circuit in Fig. is required to implement the function vo = v2 – 2v1.
2. Determine the values Ra and Rb that give the desired relationship.
3. Suppose that v2 = V2 = + 8 V and v1 = V1 = -8V; find the current in each resistor and power dissipated in each resistor.



1. Explain and derive the suitable expression of lowpass Sallen-Key circuit. Also mention the effects of A(s) on Sallen-Key circuit.
2. Define Chebyshev polynomials with their mathematical expression. Write and plot first four of the polynomials for
3. Explain and draw the practical bandpass magnitude response. Design a delyiannis bandpass circuit with and midband gain H = 26 . Use LM741 opamp.
4. Explain the Chebyshev filter. Determine and plot the location of the Chebysheve poles for degree n = 3 and .
5. Synthesize the transfer function using feed forward three amplifier biquad techniques.
6. Compare filters with circuit diagram of Sallen-Key filter, GIC filter and Ackerberg-Mossberg filter.
7. Draw and explain Miller integrator circuits.
8. A lowpass filter is to be designed whose polse in the normalized s-plane are located at -0.577 ± j0.8165. the dc gain (w → 0) is to be 2. The frequency is scaled by (). Find the value of pole frequency and pole quality factor and design a circuit to realize the specifications.
9. The following specifications are given for Chebyshev lowpass filter:

Compute the degree of the function and compare the degree that would be required for maximally flat filter for same specifications.

1. Write short note any two of the following:
2. Inverse chebyshev filter (b) Cauer filters (c) Butterworth response (d) Arbitrary transmission zeros
3. Use the circuit of Fig.1 to design a bandpass filter with a center frequency of () and a bandwidth of 200 rad/sec. The midband gain must be (H = 1).



Fig.1