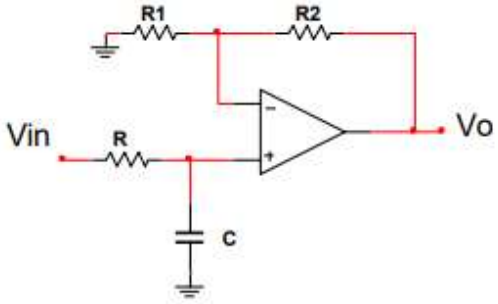
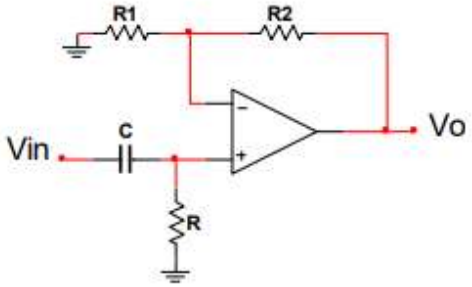
Electronic Systems
Active Filters
Sheet 2

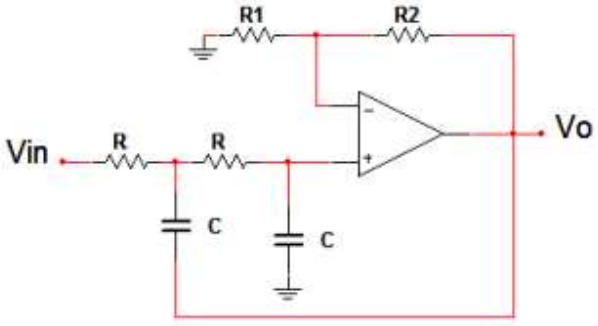
1. For the circuits shown:
   - Derive the Circuit transfer function $A_v(S)$.
   - Determine the maximum gain (Am) and cutoff frequency f_c.
   - Determine the unity gain frequency f_T.
   - Design the circuit for maximum gain of 20 and cutoff freq. of 20 KHz.
   - What is the type of the filter?

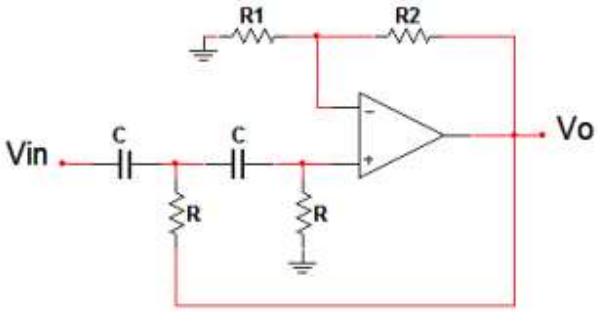




2. For the circuits shown:
   - Derive the Circuit transfer function $A_V(S)$.
   - Determine the maximum gain (A_m) and cutoff frequency (f_c).
   - Design the circuit for cutoff frequency of 10 KHz.

   Given: for n=2 the Butterworth polynomial Bn(S) is (S^2 +1.414S+1).





3. Design a 3rd order Butterworth LPF with a cut-off frequency 30 KHz. For n = 3, $Bn(S) = (S+1)(S^2+S+1)$.

4. Design a 5th order Butterworth LPF with a cut-off frequency of 50 KHz. For n = 5, $Bn(S) = (S+1)(S^2+0.618S+1)(S^2+1.618S+1)$.

5. Design a 5th order Butterworth BPF with an operating frequency band from 10 KHz to 50 KHz. For n = 5, $Bn(S) = (S+1)(S^2+0.618S+1)(S^2+1.618S+1)$.

6. Design a 6th order Butterworth BSF with a rejection frequency band from 20 KHz to 60 KHz. For n = 6, $Bn(S) = (S^2+0.517638S+1)(S^2+1.414214S+1)(S^2+1.931852S+1)$.