Electrical noise – counter measures and calculation
Mandatory task 1

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1 LM741

1.1 Transient Analysis

Resistors $R11$ and $R12$ makes a negative feedback network. Inut is applied in the positive terminal, so it is a non-inverting amplifier.

Since the gain of a non-inverting amplifier is given as $A_v = 1 + R11/R12$, and $R11$ and $R12$ have values 10K and 1K, the gaon is 11 in theory.

Relation between DC input, AC input, gain and output range...

From figure 2 and 1, it is seen that DC-offset interval is -300 mV to 200 mV. When the offset is beyong this interval the ouput saturates to either +ve or -ve supply rail.

1.2 AC Analysis

1.3 DC-offset

1.4 Load capacitance

2 Frequency charactersitcs of some curves

2.1 FFT

2.2 FFT-2

2.3 Tuning

3 Decoupling capacitors

Given L = 10 nH for each capacitor, traingular wave with Vpp 0-1A, Tr = Tf = 5ns, Ton = 0, period = 10us, to be stable within 5% of 1.5V, lower corner frequency at 1MHz.

3.1 a

Low frequency target impedance $Zt = kdV/dI$ where k is 2, dV is 0.075 and dI is 1A, hence 0.15 Ohm.

3.2 b

$n = 2L/Z_t t_r$, where L is 10H, tr is 5 ns 27

3.3 c

Also Xc must be < Zt 1.1 uF which is 40nF for each.

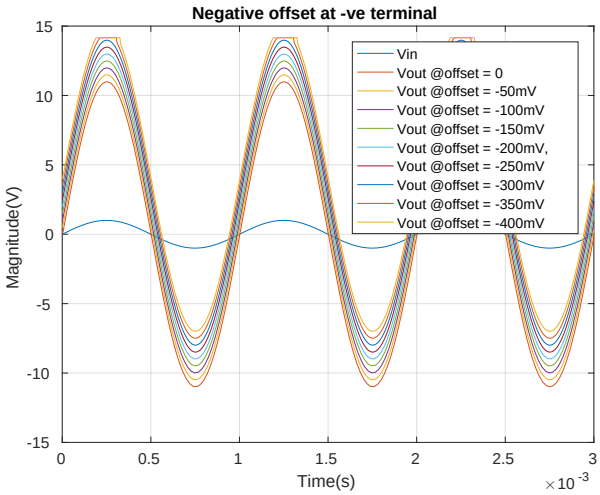

Figure 1: Vout with -ve offset at -ve terminal

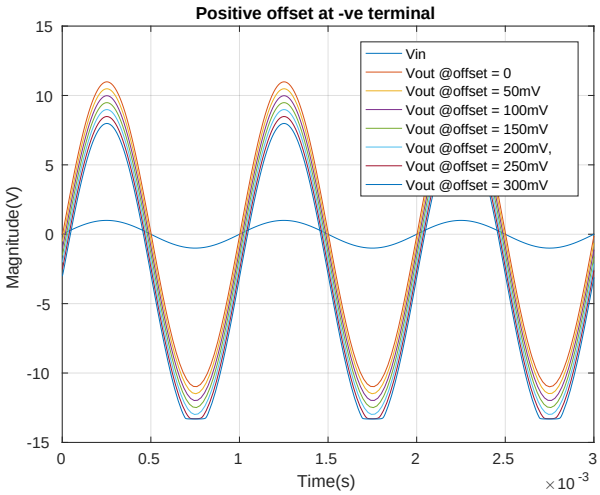

Figure 2: Vout with +ve offset at -ve terminal

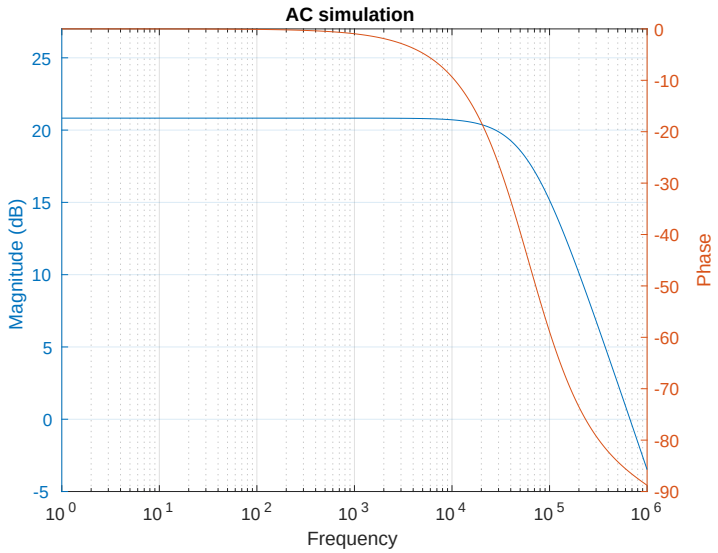

Figure 3: AC analysis of given opamp

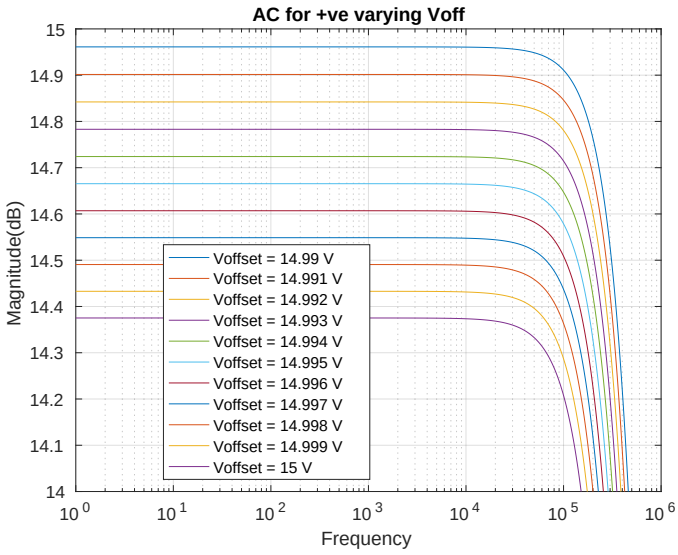

Figure 4: AC analysis with varying +ve offset

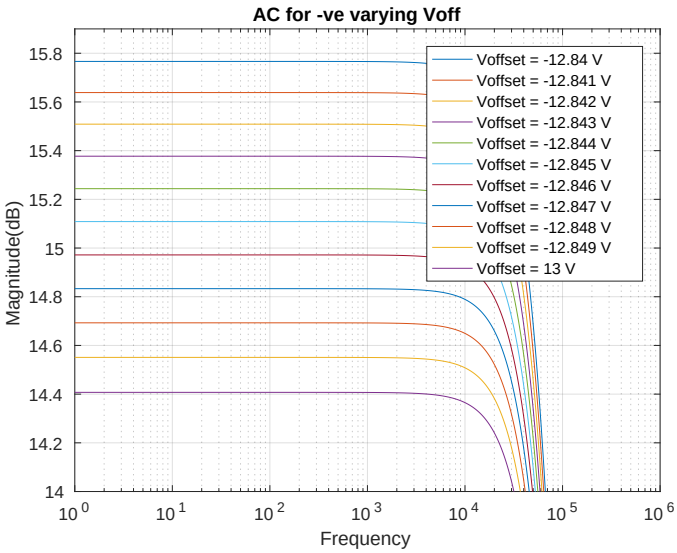

Figure 5: AC analysis with varying -ve offset

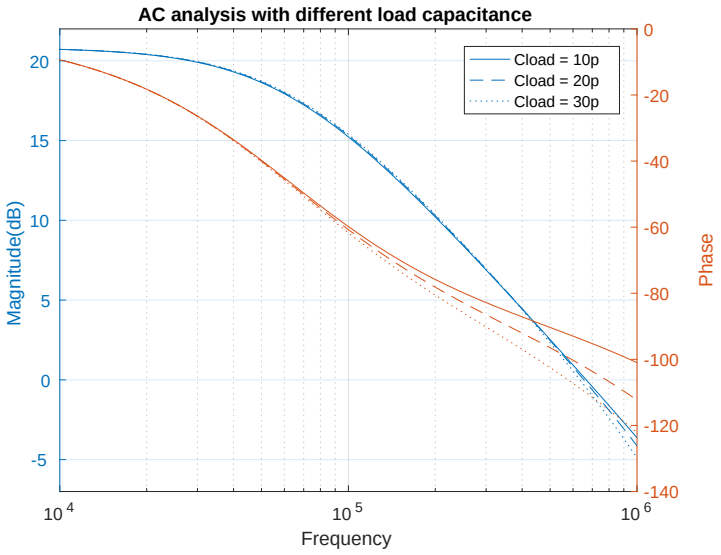

Figure 6: AC analysis with different load capacitance

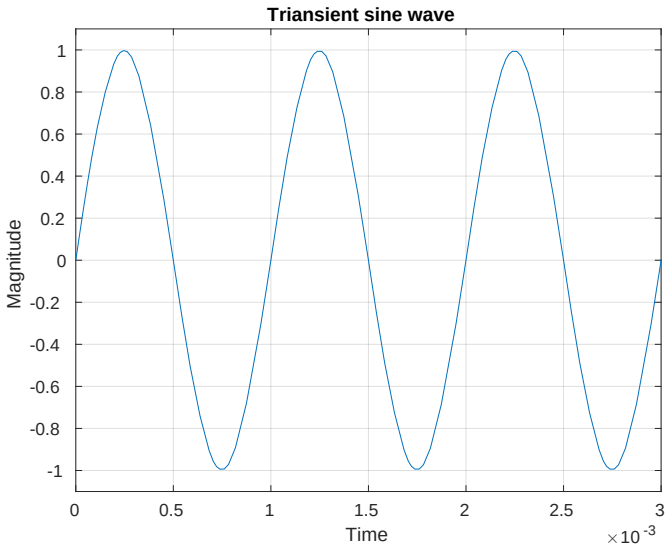

Figure 7: Sine wave

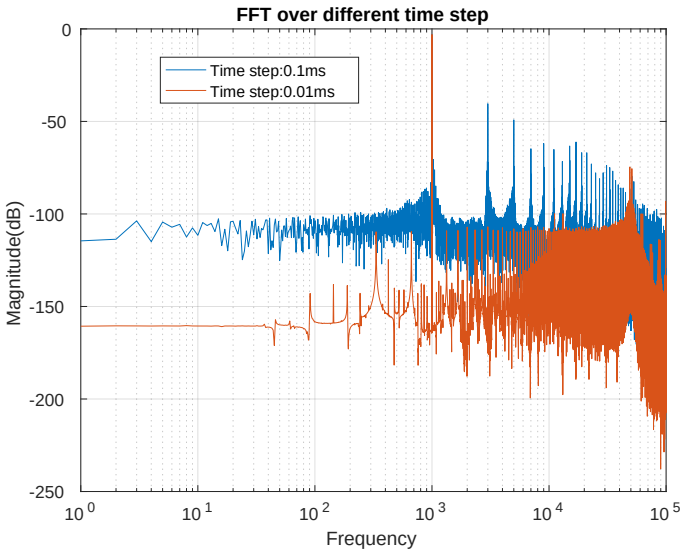

Figure 8: FFT of 7 with different time step

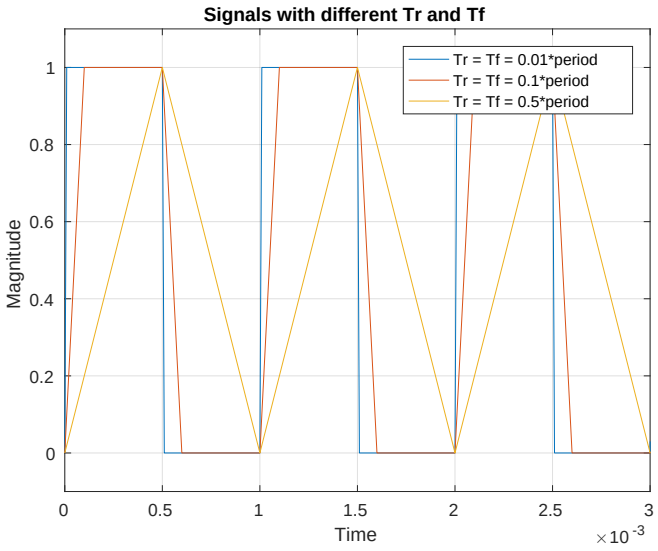

Figure 9: Signals with different rise and fall time

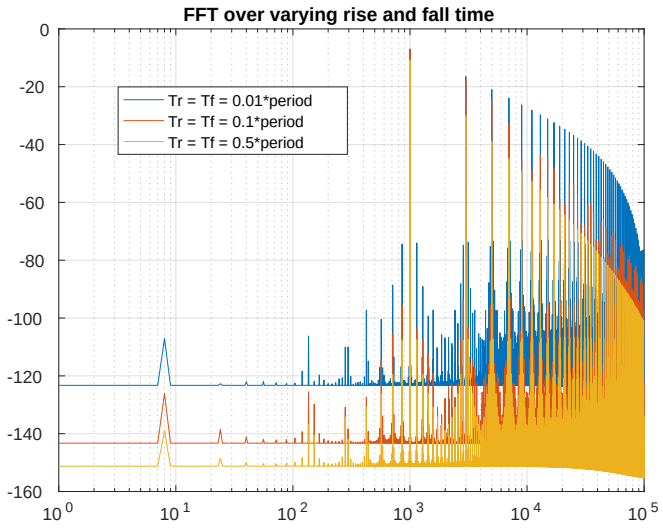

Figure 10: FFT of 9 signals

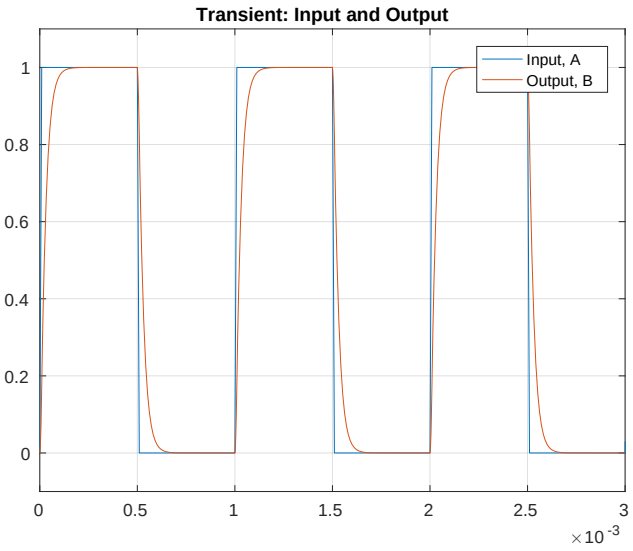

Figure 11: Input and output of LP filter

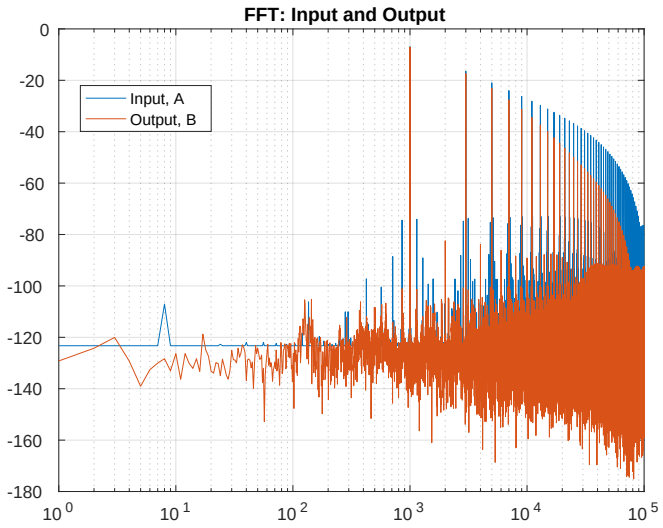

Figure 12: FFT of 11 signals