Prelab 11 and 12

7/18/22

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Part 1: Lab 11

Table

V_2 = 2.5			
Vds	Vgs (mV)	Id (mA)	V1
0	2.475	0	0
0.008529	2.44	0.000356	0.4
0.019	2.405	0.00071	0.8
0.021	2.396	0.000799	1.1
0.028	2.379	0.000975	1.4
0.038	2.353	0.001238	1.7
0.051	2.327	0.001499	2.5
0.107	2.26	0.002176	3
0.215	2.225	0.002532	3.1
0.312	2.224	0.002534	3.2
0.412	2.224	0.002534	3.3
0.512	2.224	0.002534	3.4
V_2 = 3			
0	2.97	0	0
0.005374	2.926	0.00045	0.5
0.011	2.881	0.000899	1
0.018	2.837	0.001347	1.5
0.022	2.81	0.001616	1.8
0.028	2.775	0.001974	2.2
0.033	2.748	0.002243	2.5
0.04	2.713	0.0026	2.9
0.048	2.678	0.002956	3.3
0.057	2.642	0.003311	3.7
0.073	2.59	0.003842	4.3
0.089	2.546	0.004282	4.8
0.124	2.477	0.004978	5.6
0.19	2.402	0.005736	6.5
0.266	2.364	0.006121	7
0.294	2.358	0.006187	7.1
0.338	2.353	0.006238	7.2
0.432	2.352	0.006243	7.3
0.532	2.352	0.006243	7.4
V_2 = 3.5			
0	3.465	0	0
0.003699	3.421	0.000451	0.5
0.007609	3.376	0.000902	1

0.012	3.331	0.001353	1.5
0.016	3.287	0.001803	2
0.021	3.242	0.002254	2.5
0.026	3.198	0.002704	3
0.031	3.153	0.003153	3.5
0.037	3.109	0.003603	4
0.043	3.064	0.004051	4.5
0.05	3.02	0.0045	5
0.058	2.975	0.004947	5.5
0.066	2.931	0.005395	6
0.069	2.914	0.005573	6.2
0.075	2.887	0.005841	6.5
0.081	2.861	0.006108	6.8
0.085	2.843	0.006286	7
0.09	2.825	0.006464	7.2
0.097	2.799	0.00673	7.5
0.0104	2.773	0.006996	7.8
0.11	2.755	0.007173	8
0.115	2.738	0.007349	8.2
0.125	2.711	0.007614	8.5
0.135	2.685	0.007877	8.8
0.143	2.668	0.008052	9
0.151	2.651	0.008227	9.2
0.164	2.625	0.008487	9.5
0.179	2.599	0.008746	9.8
0.19	2.582	0.008918	10
0.203	2.566	0.009088	10.2
0.225	2.541	0.009341	10.5
0.252	2.516	0.009589	10.8
0.274	2.5	0.00975	11
0.337	2.47	0.01	11.4
0.361	2.463	0.01	11.5
0.5		0.01	
$V_2 = 4$			
0	3.96	0	0
0.002887	3.916	0.000452	0.5
0.005889	3.871	0.000904	1
0.009014	3.826	0.001355	1.5
0.012	3.781	0.001807	2
0.016	3.737	0.002258	2.5
0.019	3.692	0.00271	3
0.023	3.647	0.003161	3.5
0.027	3.603	0.003612	4
0.0031	3.558	0.004063	4.5
0.035	3.514	0.004513	5
0.04	3.469	0.004964	5.5

0.043	3.442	0.005234	5.8
0.045	3.424	0.005414	6
0.05	3.38	0.005864	6.5
0.055	3.335	0.006313	7
0.058	3.317	0.006493	7.2
0.061	3.291	0.006762	7.5
0.067	3.246	0.007211	8
0.07	3.229	0.007391	8.2
0.074	3.202	0.00766	8.5
0.082	3.158	0.008108	9
0.085	3.14	0.008287	9.2
0.089	3.113	0.008555	9.5
0.094	3.087	0.008823	9.8
0.098	3.069	0.009002	10
0.102	3.051	0.00918	10.2
0.107	3.025	0.009448	10.5
0.113	2.998	0.009715	10.8
0.118	2.981	0.009893	11
0.122	2.963	0.01	11.2
0.129	2.937	0.01	11.5
0.25		0.01	
0.4		0.01	
0.55		0.01	

Table 2.

Vgs	Id (mA)
1.98	0.003553
2.136	0.931
2.224	2.537
2.293	4.338
2.352	6.244
2.404	8.219
2.451	10
2.494	12
2.535	14
2.573	17
2.609	19
2.755	20
2.992	20

Multisim

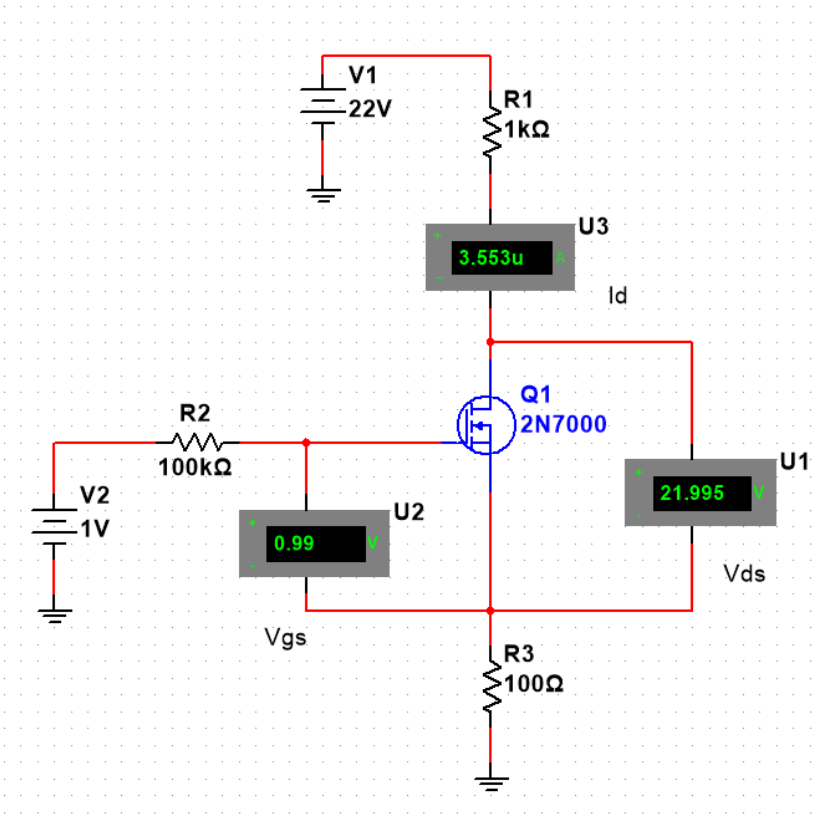

Figure 1. Lab 11 circuit

Plot

The blue line marks the saturation region.

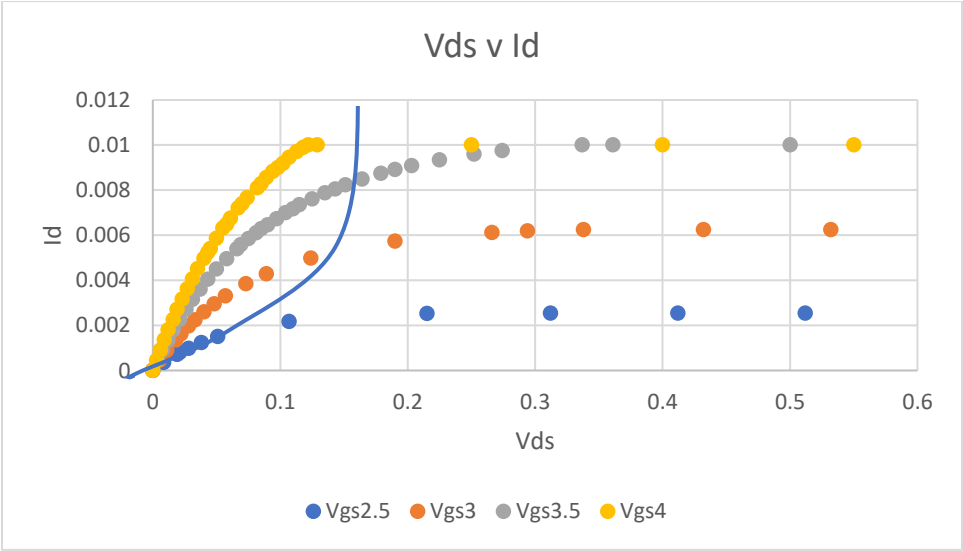

Figure 2. Characteristic curves

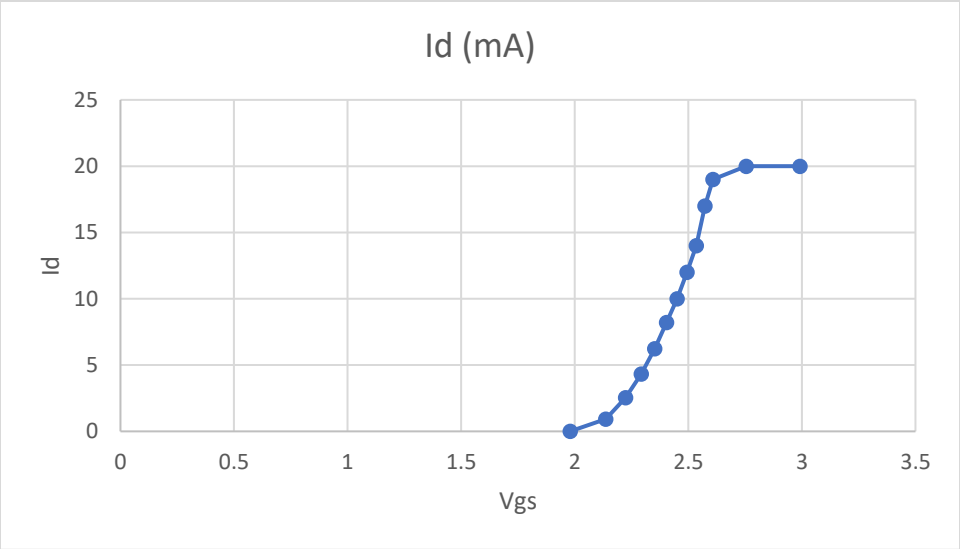

Figure 3. Id v Vgs

Part 2: Lab 8

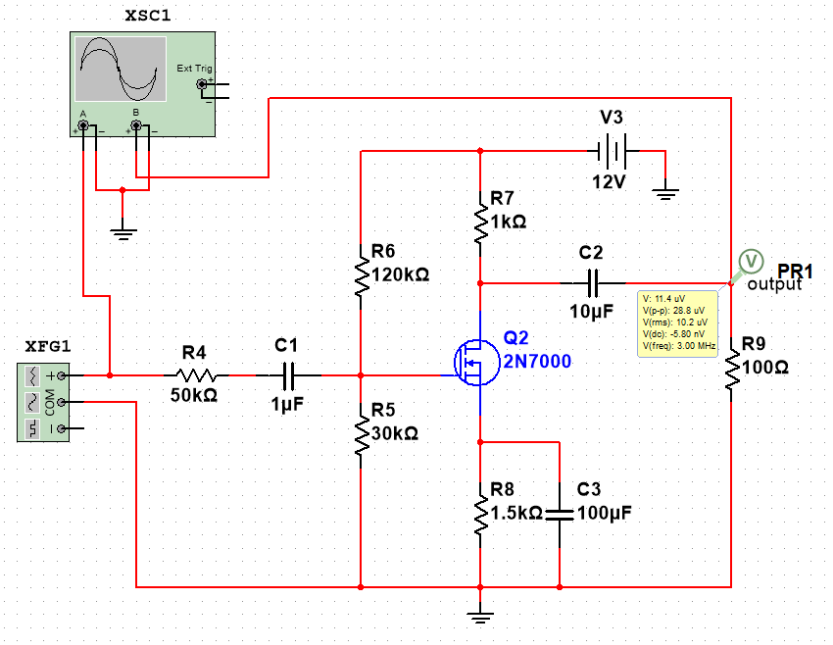

Figure 4. MOSFET Amplification Circuit

Table

F(HZ)	V_{OUT}	Gain(db)
10	0.02135	-13.4120424
30	0.06591	-3.62097377
60	0.126	2.007410902
100	0.192	5.666024574
200	0.286	9.127320663
1k	0.368	11.31695637
2k	0.372	11.4108588
5k	0.37	11.36403448
10k	0.372	11.4108588
15k	0.372	11.4108588
20k	0.371	11.38747819
50k	0.363	11.1981325
75k	0.352	10.93085327
100k	0.338	10.57833401
150k	0.305	9.685996787
200k	0.271	8.659385817
500k	0.145	3.227360045
750k	0.102	0.172003435
1M	0.07789	-2.17036592
1.5M	0.0534	-5.44917486
2M	0.04295	-7.34073664
3M	0.02952	-10.5976729

Gain:20*Log(V_{out}/100mV)

Vout is V(p-p)

Slightly out of phase, more in phase around 2k

Divide highest gain by sq(2) for bandwidth which gives 8.

Plot

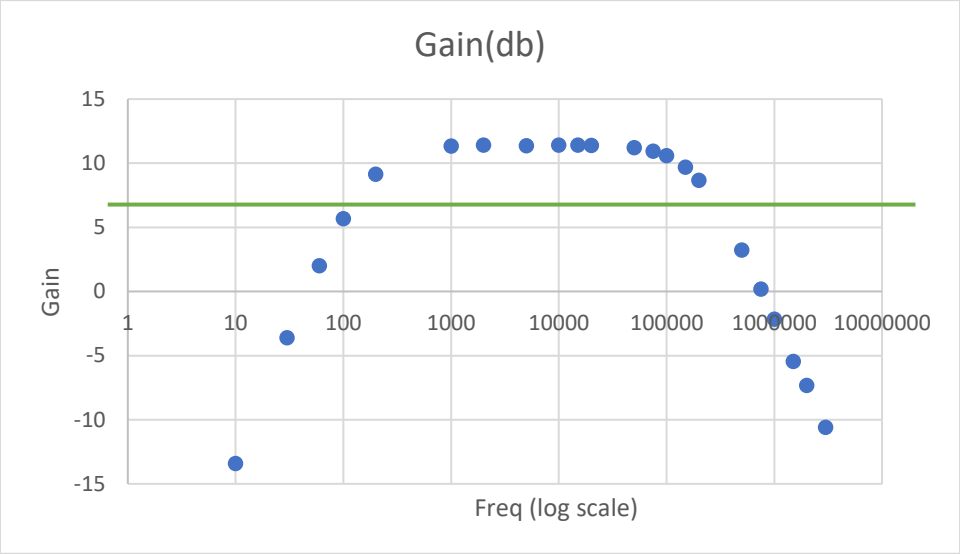

Figure 4. Plot of Gain

Output Waveforms

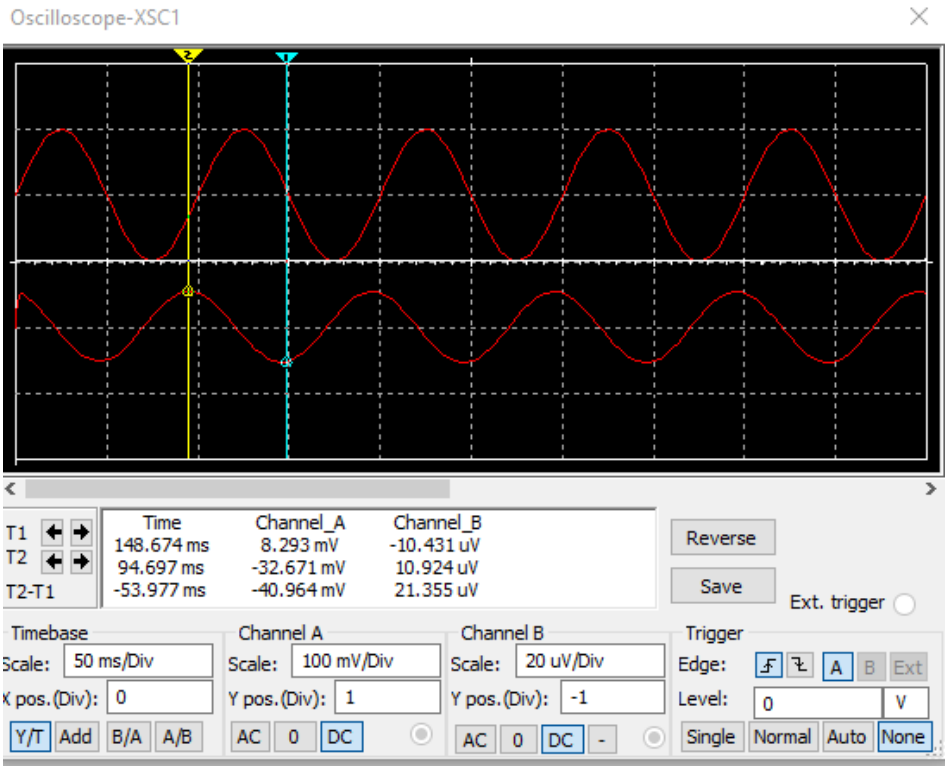

Figure 5. 10 Hz waveform Output

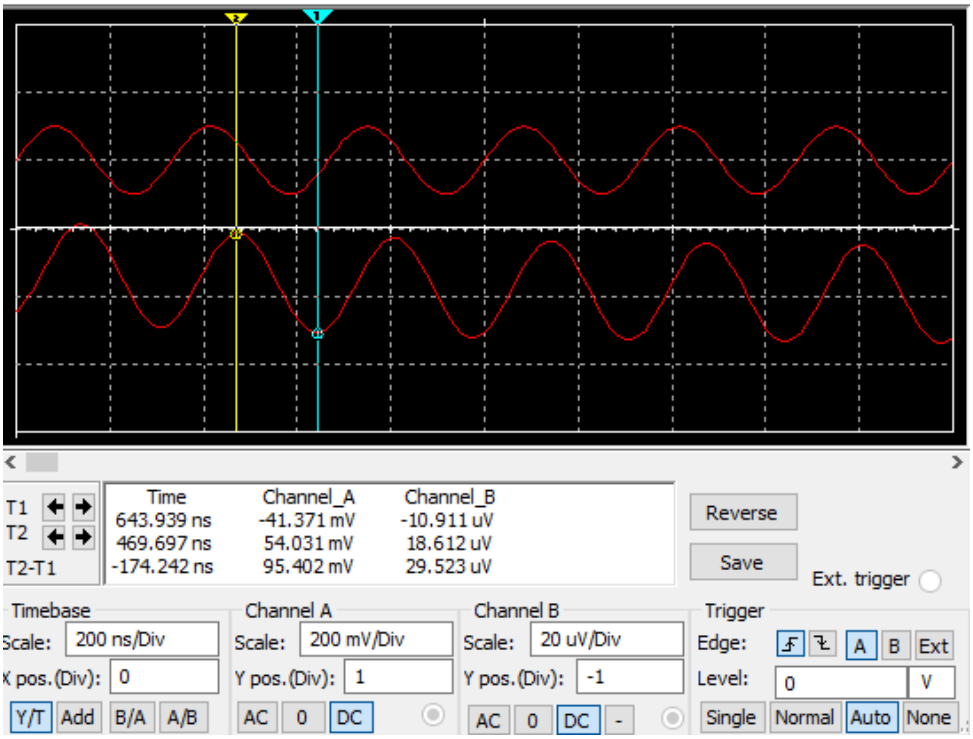

Figure . 3M Hz Output Waveform