Prelab 9 and 10

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## Part 1: Lab 9

### Table

Also added was the V1 and V2 values for reference

To note actual values of Vgs in simulation were: 0 was 0.091, -0.5 was -0.545, and -1 was exactly -1.

**Table 1.** Output Characteristics

|  |  |  |  |
| --- | --- | --- | --- |
|  | VGS = 0 | VGS = -0.5 | VGS = -1 |
| VDS | Id (mA) | Id (mA) | Id (mA) |
| 0 | 0.04 | 0.037 | 0.033 |
| 0.5 | 0.891 | 0.595 | 0.395 |
| 1 | 1.538 | 0.979 | 0.567 |
| 2 | 2.175 | 1.119 | 0.572 |
| 4 | 2.213 | 1.131 | 0.578 |
| 8 | 2.26 | 1.155 | 0.59 |
| 12 | 2.306 | 1.178 | 0.602 |
| 16 | 2.352 | 1.204 | 0.615 |
| 20 | 2.398 | 1.226 | 0.629 |

**Table 2.** Transfer Characteristics

|  |  |
| --- | --- |
| VGS | VDS = 6 |
| 0 | 2.236 |
| -0.5 | 1.142 |
| -1 | 0.584 |
| -1.5 | 0.159 |
| -2 | 0 |

### Observations

Vp looks to be Vds = 3, the green line on the plot marks the Vp. Vth is around -1.5.

For the transfer characteristics, the star marks Vp at -2 and the green line marks the network, with the Q point being around (-0.75, 0.75).

### Multisim

Diagram, schematic

Description automatically generated

**Figure 1.** Lab 9 circuit

### Plot

**Figure 2.** Drain Characteristic curves

**Figure 3.** Transfer Characteristics

## Part 2: Lab 10

Diagram, schematic

Description automatically generated

**Figure 3.** JFET Amplification

### Table

Used the V(p-p) value that the probes gave. Vin was 0.113.

**Table 3.** Output and Gain

|  |  |  |
| --- | --- | --- |
| F(HZ) | VOUT | Gain(db) |
| 30 | 0.443 | 11.86651 |
| 45 | 0.553 | 13.79293 |
| 60 | 0.627 | 14.88378 |
| 100 | 0.723 | 16.1212 |
| 200 | 0.781 | 16.79145 |
| 500 | 0.8 | 17.00023 |
| 1k | 0.804 | 17.04355 |
| 10k | 0.804 | 17.04355 |
| 100k | 0.805 | 17.05435 |
| 500k | 0.804 | 17.04355 |
| 1M | 0.802 | 17.02192 |
| 1.5M | 0.798 | 16.97849 |
| 2M | 0.792 | 16.91293 |
| 3M | 0.774 | 16.71325 |
| 4M | 0.754 | 16.48586 |
| 5M | 0.732 | 16.22865 |
| 7M | 0.68 | 15.58861 |
| 10M | 0.596 | 14.44336 |
| 11M | 0.57 | 14.05593 |
| 12M | 0.545 | 13.66636 |
| 15M | 0.481 | 12.58133 |
| 16M | 0.461 | 12.21245 |

### Observations

Out of phase waveforms. The higher the frequency the more the waveforms become more or less than (depending on how you want to say it) 180 degrees out of phase. Looked to be getting closer to 180 again if we looked at frequencies beyond 16M. Around 1k to 1M Hz the waveforms were closer to exactly 180 degrees out of phase. Low frequencies, the waveforms look like lines. At 10k you start to be able to see a bit of a wave.

The amplifier must maintain a gain ≥ 12.05 found by dividing the highest gain by square root of 2. It is marked by the green line on the plot. This makes the bandwidth between 45 Hz and 15M Hz.

### Plot

**Figure 4.** Plot of Gain

### Output Waveforms

Chart

Description automatically generated

**Figure 5.** 1M Hz waveform Output