Prelab:
1. Familiarize yourselves with data sheets for the 2N7000 MOSFET.
2. Design a circuit for biasing the enhancement n-channel 2N7000 MOSFET employing the voltage-divider bias to meet the following specifications:
   a) $V_{DD} = 16\, \text{V}$.
   b) Set the operating Q-point at $I_D = 4\, \text{mA}$ and $V_{DS} = 8\, \text{V}$.
   c) Current through the voltage divider $I_{VD} \leq 20\, \mu\text{A}$, which is the current flowing through $R_1$ and $R_2$.
3. Draw the DC load line for the specified case and label the slope and the crossing points.
4. Calculate $g_m$ and $r_o$, at $I_D = 1\, \text{mA}$ and $4\, \text{mA}$ assuming $V_A = -50\, \text{V}$. How does the drain current affect $g_m$ and $r_o$?

Experiments:
1. Measure and plot the $I_D-V_{GS}$ and $I_D-V_{VS}$ characteristics of the 2N7000 MOSFET for $V_{GS}\leq 2.25\, \text{V}$ and $V_{DS}\leq 10\, \text{V}$ using the test circuit shown in Fig. 3-b. Measure the threshold voltage $V_t$ of the MOSFET. Enter the collected data in the data table.
2. Build and test the circuit for biasing the MOSFET designed in prelab 2 (Fig. 3-a). Measure $V_S$, $V_G$, $V_D$, $V_{GS}$, $V_{DS}$, $V_{DG}$, and $I_D$. Adjust the component values so that the given specifications are met.

Postlab:
Submit a written report.
1. Plot $I_D-V_{GS}$ and $I_D-V_{DS}$ characteristics of the 2N7000 MOSFET and determine $g_m$ and $r_o$, at $I_D=4\, \text{mA}$ from the slope of the measured characteristics.
2. Compare the theoretical and measured results, i.e., $V_S$, $V_G$, $V_D$, $V_{GS}$, $V_{DS}$, $V_{DG}$ and $I_D$.
3. Compare $I_D-V_{DS}$ curves obtained from curve tracer and measured point by point.
4. Give conclusions drawn from the experiments.

**Circuit Schematics:**

Figure 3-a: Voltage-Divider Self-Bias. Figure 3-b: MOSFET Test Circuit.

**Data Table:** Measure and record $I_D$ at the corresponding $V_{GS}$ and $V_{DS}$.

<table>
<thead>
<tr>
<th>$V_{GS}$</th>
<th>0.1V</th>
<th>0.2V</th>
<th>0.3V</th>
<th>0.4V</th>
<th>0.5V</th>
<th>1.0V</th>
<th>2.0V</th>
<th>4.0V</th>
<th>6.0V</th>
<th>8.0V</th>
<th>10.0V</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.25V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.75V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.50V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>