Experiment 6

MOS Field-Effect Transistors

1. OBJECTIVES

- To examine some features of Common Source MOSFET Single stage amplifiers.

**COMMON-SOURCE MOSFET AMPLIFIER (Simulation)**

Draw the schematic shown in Fig. 1. For NMOS use the Power NMOS. This device can be obtained from the Capture toolbar by clicking on PLACE-🡪PSPICE COMPONENTS-🡪DISCRETE**→**Power NMOS. The voltage sourceV1 and V2 are VSIN and VDC from the SOURCE library respectively.



A

Vo

Fig. 1

Rin

1. Find the drain current and verify that the transistor is operating in the saturation region. For the later one, you would need to know the threshold voltage of the transistor. For that you go to the simulation page and on the left side there are several icons. Click on the one that says “View Simulation Output file”. It gives netlist and the properties of the transistor. From the properties of the transistor you can obtain the value of the threshold voltage which is indicated as VT0.
2. Measure the gain Vo/V1. Place the voltage probe above resistor R5 and measure the amplitude of the voltage. You need to do the Time-Domain Analysis with the following parameters: Run to Time = 30ms; Start Saving Data after = 25ms; Maximum Step size = 1u.
3. Measure the input resistance (Rin) looking into point A. This can be done by measuring the ac voltage at A and ac current going into node A. You can measure the ac voltage at A by attaching the voltage probe at point A. The simulation parameters are same as in step-2. The ac current at point A is same as the one passing through the capacitor C3. The current through the capacitor C3 can be obtained as follows. At the simulation window delete the voltage curve. Then obtain the current by clicking: TRACE→ADD TRACE→I(C3). The ratio of the voltage and this current gives input resistance looking into point A.