

## Homework 6

Assigned 15 March 2004; due Wednesday 31 March 2004

**Note: Visit to Microfabrication Laboratory in Cory Hall. Gather Wednesday Mar. 17 at 4 pm at the 4<sup>th</sup> floor passenger elevator by the illuminated display of micromotor pictures. Matt Last will meet you there and give a tour of the lab where we make integrated circuit, microelectromechanical and superconducting devices.**

Reading: Sections 25.4-5 Semiconductor amplifiers and switches; 28.1 Diodes; 28.3 AC/DC converter (DC power supply)

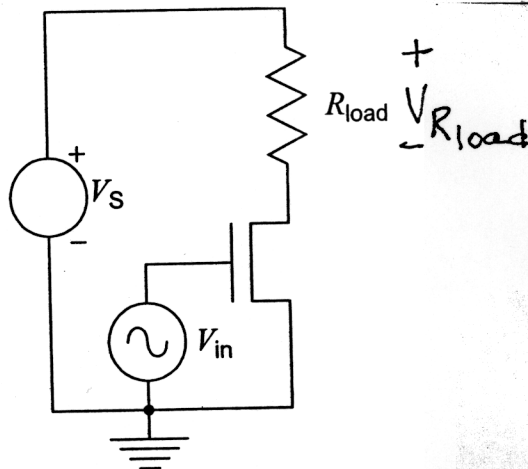
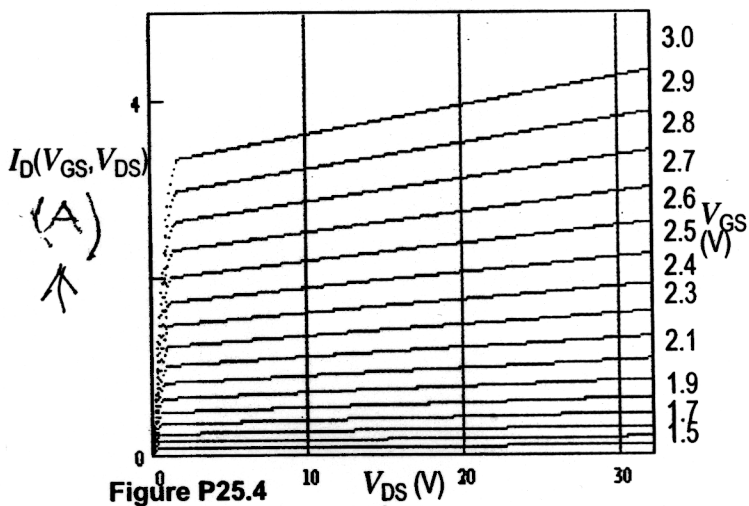
**Problem 25.4 as corrected here:**

An n-channel field-effect transistor is used to drive an 8-ohm loudspeaker, represented as  $R_{load}$ , in the circuit shown below. The power supply voltage is 32 V and the signal applied to the gate ranges from 1.5 V to 3 V. Correct the units on the vertical, current axis to amperes (A) instead of milliamperes (mA).

(a) Plot the load line of the circuit involving the power supply and the speaker onto the graph of the transistor's  $I_D$ - $V_{DS}$  characteristics, which are plotted in Fig. 25.4.

(b) Find the value of the voltage that appears across the speaker for each voltage applied to the gate.

(c) Plot the speaker voltage,  $V_{Rload}$ , versus the input voltage,  $V_{in}$ , for this amplifier. Is the amplifier characteristic linear? *(If it's linear the signal won't be distorted.)*



**Problem 28.7**

**Problem 28.8**