ECE 252 **Introduction to Electrical Engineering** **Quiz 16P**
100 Points **Show your work.** **Practice** Solution

1. (5) Convert the binary number 11001010 to decimal.

$128 + 64 + 8 + 2 = 202$

2. (5) Convert the decimal number 137 to binary.

$137/128 = 1$ + Rmndr 9 → 10001001
$9/8 = 1$ + Rmndr 1
$1/1 = 1$

3. (40) An 8-bit A/D converter has $V_{ref-} = -0.1$ V and $V_{ref+} = 1.3$ V. A) If the input analog voltage is 0.2 V, what is the binary output of the A/D converter? B) If the input analog voltage is 1.5 V, what is the binary output of the A/D converter?

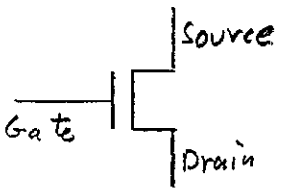
A) $V = \frac{255\,(V_{in} - V_{ref-})}{(V_{ref+} - V_{ref-})} = \frac{255\,(0.2 - (-0.1))}{(1.3 - (-0.1))} = 54.6$ decimal

$54.6/32 = 1$ with rmndr 22.6
$22.6/16 = 1$ " " 6.6
$6.6/4 = 1$ " " 2.6
$2.6/2 = 1$ " " 0.6

→ 00110110

B) Since $V_{in} > V_{ref+}$, output is max (11111111)

4. (25) Draw and label a MOSFET. Describe how it works in digital applications.



When a positive voltage is applied between the gate and the drain, the MOSFET conducts, i.e. the source and drain are connected. If there is no voltage on the gate, the MOSFET does not conduct — it acts like an open switch.

5. (15) Describe the difference between CISC and RISC microprocessors.

CISC = Complex instruction set computer
RISC = Reduced " " "
CISC computers have lots of powerful instructions of different lengths
RISC " " a few simple instructions, all of the same length.

6. (10) What's the difference between mask ROM and OTP ROM?

mask ROM has its bits burned at the factory.
OTP (one-time programming) ROM can be burned (once) in the field.