

**EECS 170A Section B
Homework Solution #1**

- 1) In a modern integrated circuit, there are 10^8 transistors. They fit onto one chip. The chip size is typically about 1 cm x 1 cm. Calculate the area that each transistor occupies. If the area is a square geometry, calculate the length of one side of the square.

(30pts) Area of each transistor is $1 \text{ cm}^2 / 10^8 \text{ transistors} = 10^{-8} \text{ cm}^2 / \text{transistor}$

(20pts) Length of one side of the square: 10^{-4} cm or $1 \mu\text{m}$

- 2) A current of 1 A flows through a wire of diameter 1 cm.
- How many electrons per second flow past a plane perpendicular to the wire.
 - What is the current density in the wire.

(25pts) a. $1 \text{ amp} = 1 \text{ Coulomb/second} = 6.24 \times 10^{18} \text{ e/second}$

(25pts) b. $J = I/A = 1 \text{ amp} / (\pi (0.5 \text{ cm})^2) = 1.27 \text{ amps/cm}^2$