Hackathon 1 – 2025

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Write a C program to calculate the temperature at which in an n-type semiconductor the electron concentration is $10 \times N_D$ using either Newton Raphson or Secant method Given:

$$
\begin{aligned}
N_C &= 3 \times 10^{25} \, (T/300)^{1.5} \;\; m^{-3} \\
N_V &= 1 \times 10^{25} \, (T/300)^{1.5} \;\; m^{-3} \\
N_D &= 10^{22} \;\; m^{-3} \\
E_C - E_D &= 0.05 \;\; eV \\
k_B &= 1.381 \times 10^{-23} m^2 \;\; kg/(Ks^2) \\
q &= 1.6 \times 10^{-19} C
\end{aligned}
$$

The relationship between carrier concentration and temperature is given by

$$
n = \frac{N_D N_C}{N_C + 2ne^{(E_C - E_D)/(k_B T)}} + \frac{N_C N_V}{n} e^{-E_G/k_B T}
$$