Home work 2

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Relative permittivity ϵ_r

Relative permititivities at room temperature
Silicon($\epsilon_{r,s}$) : 11.68
Silicon dioxide($\epsilon_{r,d}$) : 3.9

Case1

Thickness[m] : 3×10^{-3}(silicon), 7×10^{-3}(silicon dioxide)

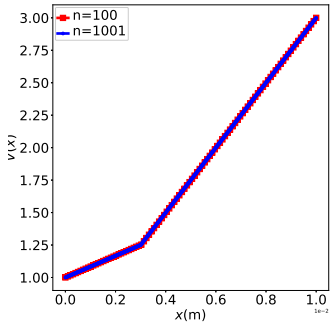

Figure 1: The position x versus electric potential $V(x)$.
The boundary conditions for $V(x)$: $V(x = 0) = 1$ and $V(x = 10^{-2}) = 3$ where $0 \leq x \leq 10^{-2}$
The silicon domain is $0 \leq x \leq 3 \times 10^{-3}$ and the silicon dioxide is $3 \times 10^{-3} \leq x \leq 10^{-2}$.
Capacitance per area: $4.31 \times 10^{-9}[C^2/Nm^3]$ (numeric)
Capacitance per area: $4.31 \times 10^{-9}[C^2/Nm^3]$ (theory)

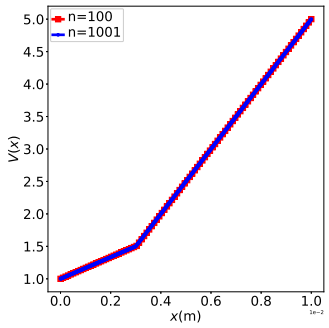

Figure 2: The position x versus electric potential $V(x)$.
The boundary conditions for $V(x)$: $V(x=0)=1$ and $V(x=10^{-2})=5$ where $0 \leq x \leq 10^{-2}$
The silicon domain is $0 \leq x \leq 3 \times 10^{-3}$ and the silicon dioxide is $3 \times 10^{-3} \leq x \leq 10^{-2}$.
Capacitance per area: $4.31 \times 10^{-9}[C^2/Nm^3]$ (numeric)
Capacitance per area: $4.31 \times 10^{-9}[C^2/Nm^3]$ (theory)

Case2

thickness$[m]$: 5×10^{-3}(silicon), 5×10^{-3}(silicon dioxide)

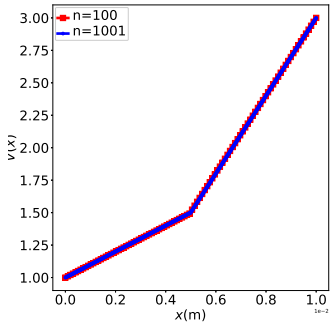

Figure 3: The position x versus electric potential $V(x)$.
The boudary conditions for $V(x)$: $V(x=0)=1$ and $V(x=10^{-2})=3$ where $0 \leq x \leq 10^{-2}$
The silicon domain is $0 \leq x \leq 5 \times 10^{-3}$ and the silicon dioxide is $5 \times 10^{-3} \leq x \leq 10^{-2}$.
Capacitance per area: $5.18 \times 10^{-9}[C^2/Nm^3]$ (numeric)
Capacitance per area: $5.18 \times 10^{-9}[C^2/Nm^3]$ (theory)

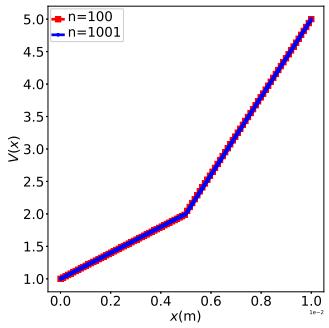

Figure 4: The position x versus electric potential $V(x)$.
The boundary conditions for $V(x)$: $V(x=0)=1$ and $V(x=10^{-2})=5$ where $0 \leq x \leq 10^{-2}$
The silicon domain is $0 \leq x \leq 5 \times 10^{-3}$ and the silicon dioxide is $5 \times 10^{-3} \leq x \leq 10^{-2}$.
Capacitance per area: $5.18 \times 10^{-9}[C^2/Nm^3]$ (numeric)
Capacitance per area: $5.18 \times 10^{-9}[C^2/Nm^3]$ (theory)