3 a.) $q = 0.02 = \frac{1}{N_r + 1} \rightarrow N_r = 49$

$T_{sw} = 2N_r \cdot T_{clk}$

$N_r = \frac{T_{sw}}{2T_{clk}}$

$q_r = \frac{1}{N_r + 1} = \frac{1}{\frac{T_{sw}}{2T_{clk}} + 1} = \frac{1}{\frac{f_{clk}}{2f_{sw}} + 1}$

$0.02 = \frac{1}{\frac{100\,MHz}{2f_{sw}} + 1}$ $\quad f_{sw} = 1.02\,MHz$

b.) $N_r = \frac{T_{sw}}{2T_{clk}} \rightarrow 2^{N_{pwm}} = \frac{f_{clk}}{2f_{sw}}$

$2^{16} = \frac{f_{clk}}{2f_{sw}} \rightarrow f_{sw} = \frac{f_{clk}}{2 \cdot 2^{16}} = \frac{100\,MHz}{2 \cdot 65,536} = 762\,Hz$

c.) $N_r \leq 2^{N_{pwm}} - 1$

$N_r \leq 2^{16} - 1$

$N_r \leq 65,535$

$q = \frac{1}{N_r + 1} = \frac{1}{65,536} = 1.5E\text{-}5$

$q = \Delta D = 0.0015\,\%$

d.) $V_o = V_{in} \cdot \frac{D}{\frac{nDR_{on}}{RD'} + \frac{D'}{n}}$ and $n = 2$, $R = 10$, $R_{on} = 15\,m\Omega$

$\Delta V_o = V_{in} \frac{\cancel{1.5E\text{-}5}\ \Delta D}{\frac{2\Delta D R_{on}}{R(1-\Delta D)} + \frac{(1-\Delta D)}{2}} = V_{in} \frac{1.5E\text{-}5}{\frac{2(1.5E\text{-}5)(15E\text{-}3)}{10(1-1.5E\text{-}5)} + \frac{(1-1.5E\text{-}5)}{2}}$

$\Delta V_o = 3E\text{-}5\ V_{in}$