1) $F = \frac{\varepsilon_0 \varepsilon_r A V^2}{2d^2} = \frac{(8.854\times10^{-12})(1)(500\times10^{-6})^2(100)^2}{2(10\times10^{-6})^2} = 110.675\,\mu N$

2) $\bar{V} = 100V$

$V_{rms} = \frac{100}{\sqrt{2}}$

$F = \frac{\varepsilon_0 \varepsilon_r A V_{rms}^2}{2d^2} = \frac{(8.854\times10^{-12})(1)(500\times10^{-6})^2(100)^2}{4(100\times10^{-6})^2} = 55.34\,\mu N$

3) $V_{PI} = \sqrt{\frac{8Kd^3}{27A\varepsilon_r\varepsilon_0}} = \sqrt{\frac{8(50)(10\times10^{-6})^3}{27(500\times10^{-6})^2(1)(8.854\times10^{-12})}} = 81.81V$

4) $F = Kx$

$\frac{\varepsilon_0\varepsilon_r A V^2}{2(d-x)^2} = Kx$

$V = \sqrt{\frac{2(d-x)^2 Kx}{\varepsilon_0\varepsilon_r A}} = \sqrt{\frac{2(10\times10^{-6}-1\times10^{-6})^2(50)(1\times10^{-6})}{(8.854\times10^{-12})(1)(500\times10^{-6})^2}} = 60.49V$

5) $f_D = f_s\left(\frac{c-\dot{x}}{c+\dot{x}}\right) = 20{,}000\left(\frac{331-10}{331+10}\right) = 18.827\,KHz$

6) $f_D = f_s\left(\frac{c+\dot{x}}{c-\dot{x}}\right) = 20{,}000\left(\frac{331+10}{331-10}\right) = 21{,}246\,KHz$