

$$1) F = \frac{\epsilon_0 \epsilon_r A V^2}{2d^2} = \frac{(8.854 \times 10^{-12})(1)(500 \times 10^{-6})^2 (100)^2}{2(10 \times 10^{-6})^2} = 110.675 \mu N$$

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

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

$$F = \frac{\epsilon_0 \epsilon_r A V_{rms}^2}{2d^2} = \frac{(8.854 \times 10^{-12})(1)(500 \times 10^{-6})^2 (100)^2}{4(100 \times 10^{-6})^2} = 55.34 \mu N$$

$$3) V_{p2} = \sqrt{\frac{8Kd^3}{27A\epsilon_r\epsilon_0}} = \sqrt{\frac{8(50)(10 \times 10^{-6})^3}{27(500 \times 10^{-6})^2(1)(8.854 \times 10^{-12})}} = 81.81V$$

$$4) F = kx$$

$$\frac{\epsilon_0 \epsilon_r A V^2}{2(d-x)^2} = kx$$

$$V = \sqrt{\frac{2(d-x)^2 kx}{\epsilon_0 \epsilon_r A}} = \sqrt{\frac{2(10 \times 10^{-6} - 1 \times 10^{-6})^2 (50)(1 \times 10^{-6})}{(8.854 \times 10^{-12})(1)(500 \times 10^{-6})^2}} = 60.49V$$

$$5) f_D = f_s \left(\frac{c-x}{c+x} \right) = 20,000 \left(\frac{331-10}{331+10} \right) = 18,827 \text{ KHz}$$

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