Homework Assignment #6 ELEC 5760/6760 Due: Wed 10/19/22

1) A parallel plate actuator (PPA) consists of two square electrodes, 500 μm on a side, separated by 10 μm, in a vacuum. What is the force produced if 100 V DC is applied across the electrodes

2) If a sinusoidal voltage with a 100 V amplitude is applied to the PPA in (1), where the frequency of the voltage signal is much higher than the natural frequency of the mechanical system, what is the average force produced by the PPA?

3) For the PPA in (1), if the system spring constant is 50 N/m, what is the pull-in voltage?

4) If the PPA in (1) is used with the spring in (3), what applied DC voltage will decrease the distance between the electrodes by 1 μm.

5) An object is moving away from a stationary 20 KHz sound source at 10 m/s. If the speed of sound in air is 331 m/s, what is the frequency of the reflected sound wave to a stationary listener?

6) If the object in (5) is moving toward the sound source, what is the frequency of the return sound wave to a stationary listener?