2009-2010 EE Ph.D. Qualifying Exam

Question area: Engineering Physics Examiner: Jelena Vuckovic

- 1. Assume that there is a lossless oscillating system whose physical property a oscillates over time with angular frequency ω . For example, you can assume that this system represents electromagnetic field in a resonator. (However, you can also think about a mass on a spring, or another oscillating system of your choice, if it is simpler for you.)
 - a) Write the equation that describes the behavior of a over time. What is its solution?
 - b) If the system is not lossless, how does the property a vary in time? How do you have to modify the equation from the part (a) to account for losses?
 - c) Now assume that such a lossless oscillator is coupled to another, identical lossless oscillator. Would the system still oscillate harmonically? If yes, at what frequency?
 - d) Could you write equations which describe the behavior of such a coupled system?