ECE 454
Final Exam Review Problems

1. Explain the relationship between antenna aperture size and directivity.

2. Assuming an aperture efficiency of 0.55, what physical diameter of a parabolic dish antenna is necessary to achieve a gain of 50 dB at 6 GHz?

3. Using Babinet’s principle, what is the input impedance of a metallic ribbon dipole that is complementary to a slot with an impedance of 200-j150 Ω?

4. What physical dimensions determine the impedance bandwidth of a frequency independent antenna?

5. Discuss the design tradeoffs between horn antennas and reflector antennas.

6. An antenna application requires an antenna with a gain of at least 10 dBi. Would you select an electrically small monopole, a half-wavelength dipole, or an aperture antenna? Justify your answer.

7. Design a microstrip patch antenna with an edge feed that resonates at 3.6 GHz on a substrate with thickness of 1.59 mm and a relative permittivity of 6.15. What is the approximate bandwidth of this antenna? If the antenna did not deliver enough bandwidth for the prospective application, what changes would you make to the design?

8. Describe how you could use the design of an antenna’s finite ground plane to achieve a desired radiation pattern directivity that would not be achievable from the same antenna on an infinite ground plane.

9. Using any of the antennas that were covered in class, describe how you could make the antenna frequency tunable (assuming external control of some kind).