1. Prove that a maximum power is transferred from a voltage source with an internal impedance Z_g to a load impedance Z_L over a lossless transmission line when $Z_i = Z_g^*$, where Z_i is the impedance looking into the loaded line.　What is the maximum power-transfer efficiency? (25%)

2. Explain the following terms: a) Hysteresis loop, b) Gauss's Law, c) Helmholtz coils, d) Magnetic Vector Potential Function, and e) Stokes's theorem (25%)

3. The distance between a transmitting and a receiving antenna in free space is d. If P_t and P_r are respectively the power radiated by the transmitting antenna and the power received in the load of the receiving antenna, show that $P_r / P_t = A_t A_r / (d\lambda)^2$, where A_t and A_r are respectively the maximum effective aperture of the transmitting and the receiving antenna and λ is the operating wavelength. (25%)

4. Explain the following terms: a)VSWR, b)microstrip line, c)Poynting theorem, d)cut off frequency , and e)dispersion　(25%)