EE 641000
Homework Assignment #3

Spring Semester, 2006

Due Date: March 30, 2006

1. Exercise 2.64 on Page 93 of the textbook.

2. (a) Exercise 2.65 on Page 93 of the textbook.

   (b) Exercise 2.66 on Page 94 of the textbook.

3. Exercise 2.67 on Page 95 of the textbook.

4. Exercise 2.72 on Page 105 of the textbook.

5. Let ρ be a density operator. A minimal ensemble for ρ is an ensemble $\{p_i, |\psi_i\rangle\}$ containing a number of elements equal to the rank of ρ. Let $|\psi\rangle$ be any state in the support of ρ. (The support of a normal operator T is the vector subspace spanned by the eigenvectors of T with nonzero eigenvalues.) Show that there is a minimal ensemble for ρ that contains $|\psi\rangle$ and moreover that in any such ensemble $|\psi\rangle$ must appear with probability

$$p = \frac{1}{\langle\psi|\rho^{-1}|\psi\rangle},$$

   where ρ^{-1} is defined to be the inverse of ρ, when ρ is considered as an operatoracting only on the support of ρ.

6. (a) Exercise 2.74 on Page 106 of the textbook.

   (b) Exercise 2.75 on Page 106 of the textbook.